

Tourist Behavior in Reducing Plastic Waste at Viet Nam's Coastal Destinations

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ABSTRACT

Plastic waste generated by tourism activities increasingly burdens the environment of coastal destinations in Viet Nam. Understanding tourists' behavior regarding plastic waste reduction is crucial for developing effective interventions at the destination level. This study employs the COM-B framework to analyze how Capability, Opportunity, and Motivation influence tourists' plastic waste reduction behaviors at selected Viet Nameese coastal sites. Data were gathered through a structured survey of 895 tourists and analyzed using descriptive statistics, reliability tests, correlation analysis, and multiple linear regression. Results show that Motivation has the most significant impact on waste reduction behavior, followed by Capability, with Opportunity exerting a lesser effect. The model accounts for a substantial portion of behavioral variation ($R^2 = 0.743$), indicating strong links between the COM-B components and self-reported behaviors. These findings enhance empirical understanding of the COM-B framework in coastal tourism settings and offer practical insights for policymakers and destination managers aiming to encourage plastic waste reduction among tourists.

1. INTRODUCTION

Plastic waste (PW) has emerged as a major global environmental challenge, particularly affecting coastal and marine tourism destinations. The United Nations Environment Program (UNEP 2021) reports that roughly 11 million tons of plastic enter the ocean each year, a number that could double by 2040 without effective interventions. Items such as water bottles, cups, bags, knives, spoons, and forks made of single-use plastic constitute a significant portion of PW (Kong et al. 2023, Maione 2021, Bauske & von Münchhausen 2019). These items also contribute to visual pollution, pose threats to marine ecosystems, and have adverse effects on the tourism industry (OECD 2024, Jang et al. 2015, McIlgorm et al. 2011).

In Southeast Asia, annual plastic waste generation reaches approximately 31 million tons (2023), with over 60% stemming from single-use plastic packaging and products (OECD 2025). The tourism sector has been identified as a key contributor, especially during peak seasons, when PW at coastal sites can comprise up to 40% of total solid waste (Truong et al. 2023, Kong et al. 2023, Hu et al. 2024, Pandey et al. 2022).

Viet Nam ranks among the five Southeast Asian countries with the highest per capita plastic waste generation, approximately 25 kg per person annually, a figure projected to rise to 79 kg per person by 2050 (OECD 2025). The country's roadmap to restrict and ban single-use plastic products is outlined in legal documents such as the Law on Environmental Protection (2020), Decree No. 08/2022/ND-CP (2022), and Decision No. 1746/QĐ-TTg of the Prime Minister (2019). Starting January 1, 2026, non-degradable plastic bags and single-use plastics will be

prohibited in supermarkets and shopping malls. For hotels and tourist areas, this ban will take effect after 2030. Key priorities also include source reduction of plastic waste, promoting sustainable tourism standards, and shifting tourists' consumption behaviors. However, effective policy implementation requires in-depth research into tourists' plastic waste reduction behaviors within specific contexts.

Previous studies on pro-environmental behavior often utilize frameworks such as the Theory of Planned Behavior (TPB) (Ajzen 1991) and the Value-Belief-Norm (VBN) framework (Stern 2000), which mainly focus on attitudes, norms, and behavioral intentions. Although insightful, these frameworks tend to overlook the influence of contextual and structural factors that facilitate or hinder behavior. To overcome these limitations, the COM-B model (Michie et al. 2011) conceptualizes behavior as the outcome of interactions among three elements: Capability, Opportunity, and Motivation. This comprehensive approach offers clearer guidance for designing behavioral interventions. Due to its strengths, the COM-B model has been increasingly employed in research on environmental behavior and sustainable development (Queiroga et al. 2025, Gainforth et al. 2016, Salehi et al. 2025).

However, within the tourism sector, the application of the COM-B model remains relatively limited, particularly in research concerning plastic waste reduction behavior at coastal destinations. Existing literature indicates that

COM-B has mainly been utilized in specific tourism intervention contexts, such as managing visitor flows through technological solutions or encouraging the adoption of innovations in tourism experiences (Wells et al. 2022). While these studies illustrate the potential of COM-B to facilitate the design and assessment of behavioral interventions, they also reveal a narrow and context-specific scope. Additionally, most research on tourists' pro-environmental behavior continues to focus on isolated behavioral components or particular tourist segments, rather than providing an integrated analysis of the mechanisms behind behavioral formation (Prawira et al. 2024). Tourism studies suggest that sustainable behavior is often explored through attitudes, intentions, or social norms, while the interactive relationship between individual capability and destination context has not yet been fully clarified (Dolničar & Grün 2008, Dolničar & Leisch 2008). Furthermore, empirical evidence from developing countries and emerging tourism destinations remains scarce.

These gaps emphasize the need for context-sensitive research that adopts comprehensive behavioral frameworks to better understand tourists' plastic waste reduction behaviors. Consequently, this study investigates tourists' plastic waste reduction behavior at three representative coastal destinations in Viet Nam: Ha Long (Quang Ninh), Sam Son (Thanh Hoa), and Cu Lao Cham–Hoi An (Da Nang). By analyzing how the components of COM-B relate



(Source: Department of Survey, Mapping and Geographic Information of Vietnam – Ministry of Agriculture and Environment, 2025)

Fig. 1: Location of study areas.

to plastic waste reduction across diverse tourist groups, this study refines the boundaries of behavioral theory. This approach broadens the focus from solely psychological drivers to a more holistic view of how external constraints and enabling factors shape sustainable practices in emerging economies.

2. MATERIALS AND METHODS

2.1. Research Location

The study was conducted at three prominent coastal destinations in Viet Nam, each attracting millions of tourists annually. Sam Son exemplifies mass tourism, mainly drawing domestic visitors from the medium- and low-spending segments. Ha Long, with its UNESCO World Natural Heritage Site, appeals to both international and domestic tourists across medium- and high-spending groups. Cu Lao Cham-Hoi An, featuring Hoi An Ancient Town as a UNESCO World Cultural Heritage Site and the Cu Lao Cham-Hoi An Biosphere Reserve, serves as a higher-end destination that attracts international tourists with substantial purchasing power. The locations of the study areas are shown in Fig. 1.

These destinations employ various practices for managing poor waste (PW). While Cu Lao Cham - Hoi An is regarded as having relatively effective management, Ha Long and Sam Son continue to face significant environmental challenges, especially concerning solid waste and PW. The survey was carried out in coastal areas, bays, and islands, emphasizing popular tourism spots in order to gather diverse data that accurately represent tourists' behaviors across different tourism settings. This approach helps ensure the survey sample's representativeness and increases the reliability and applicability of the research findings.

2.2. Research Design

This study utilizes a quantitative research approach to explore the impact of the three components of the COM-B model on tourists' behaviors related to plastic waste (PW) reduction. According to the COM-B framework, a behavior manifests when individuals possess sufficient capability, favorable opportunities, and adequate motivation to act (Michie et al. 2011, Darnton et al. 2013). The COM-B (Capability–Opportunity–Motivation–Behavior) model, developed by Michie and colleagues (Michie et al. 2011), is among the most extensively employed theoretical models for designing effective behavioral interventions. It elucidates behavior through three fundamental components.

The first component, Capability, pertains to tourists' knowledge, understanding, and skills concerning plastic waste

reduction. This includes awareness of the environmental harm caused by PW, the ability to differentiate recyclable, reusable, and single-use plastics, familiarity with relevant PW reduction regulations, and the skills necessary to use environmentally friendly alternatives. A deficit in capability serves as a significant barrier to adopting PW reduction behaviors (White et al. 2019).

The second component, Opportunity, encompasses both physical and social factors that facilitate behavior. Physical opportunities involve the availability of supporting infrastructure, such as waste-sorting stations, recycling collection points, hotels that eliminate single-use plastics, restaurants offering paper or bamboo straws instead of plastic, and free water stations for refilling reusable bottles. Social opportunities include positive influences from family, travel companions, and the tourism community, local cultural norms and sustainable consumption practices, communication campaigns advocating plastic reduction, and government policies like plastic bag restrictions and waste separation regulations. Collectively, these elements create an environment conducive to adopting and maintaining PW reduction behaviors (Michie et al. 2011).

The third element is Motivation, comprising reflective and automatic aspects. Reflective motivation involves personal responsibility, beliefs, values, goals, and deliberate choices. For instance, tourists might opt to minimize plastic usage because they believe their actions help protect the environment or boost their self-image as responsible travelers. Automatic motivation encompasses emotions, habits, and behavioral routines. For example, individuals who habitually carry reusable water bottles are more inclined to continue this practice while traveling (Michie et al. 2011). Emotions also shape behavior: feelings of pride and satisfaction can reinforce environmentally friendly actions, while guilt or discomfort triggered by witnessing improper plastic waste disposal may motivate behavioral change. Applying the COM-B model to the design and assessment of tourists' plastic waste reduction behavior offers a systematic approach for identifying barriers, recognizing enabling factors, and creating effective interventions. The research team developed a structured questionnaire based on the COM-B framework, drawing upon prior studies on sustainable consumption behavior (Michie et al. 2011, Schultz 2014). The questionnaire included five sections: (i) demographic and trip-related information, (ii) capability, (iii) opportunity, (iv) motivation, and (v) plastic waste reduction behavior. The components of the COM-B model and behavioral outcomes were assessed using a five-point Likert scale, a common measurement tool in social, psychological, and behavioral research (Likert 1932).

- Demographic and trip-related information was collected using nine items covering age, gender, nationality, education, occupation, type of tour organisation, number of visits to Ha Long Bay, length of stay, and type of accommodation.
- Capability was measured as a latent construct using five observed indicators (C1–C5): C1—understanding the harmful effects of PW on the environment and human health, C2—distinguishing between recyclable, reusable, and single-use plastic products, C3—knowing alternatives to single-use plastic products (e.g., paper or bamboo straws and cloth bags), C4—having the skills to use environmentally friendly products, and C5—knowing regulations related to plastic waste reduction.
- Opportunity was measured as a latent construct using six observed indicators (O1–O6), representing physical and social opportunities. Physical opportunities included the availability of waste collection and sorting bins (O1), food and beverage outlets that do not use single-use plastics (O2), and hotels that avoid single-use plastics (O3). Social opportunities included local cultural norms and habits regarding plastic use (O4), communication activities promoting plastic reduction (O5), and the availability of information guiding tourists on plastic waste reduction (O6).
- Motivation was measured using six observed indicators (M1–M6), representing reflective and automatic motivation. Reflective motivation included believing in one's responsibility to protect the environment and reduce plastic use (M1), believing that individual actions can create positive environmental change (M2), willingness to change personal habits to reduce plastic use and adopt green consumption practices (M3), concern about whether destinations are environmentally friendly (M4), and willingness to pay more for environmentally friendly products (M5). Automatic motivation was represented by emotional responses, specifically feeling uncomfortable when witnessing plastic waste that is not properly sorted, collected separately, or is indiscriminately discarded (M6).
- Plastic waste reduction behavior was measured as a latent construct using six observed indicators (B1–B6) representing the frequency of tourists' self-reported behaviors. These included bringing personal care items while travelling (B1), using cloth or woven bags instead of plastic bags (B2), refusing plastic straws, spoons, cups, bowls, and chopsticks (B3), encouraging family members and the community to reduce plastic use by raising awareness of its harmful effects (B4), consuming food and beverages on-site instead of ordering takeaway

(B5), and properly sorting and disposing of plastic waste (B6). Although these behaviors vary in terms of effort and context, they were included to capture a broad range of self-reported plastic waste reduction practices. The composite behavior score therefore reflects an overall tendency towards plastic waste reduction rather than the intensity of any individual behavior.

Because Viet Nam's coastal destinations attract large numbers of international visitors, particularly tourists from China, the questionnaire was translated into both English and Chinese to facilitate data collection. Before the main survey, the questionnaire was pilot-tested with 30 tourists in the Ha Long area to improve wording, ensure clarity, and refine the questionnaire based on participants' feedback.

2.3. Subjects, Time, Location, and Data Collection Process

The research involved tourists aged 15 or older who stayed at least one day. The sample size was determined based on established principles of sociological and behavioral research. In linear regression analysis, the minimum sample size required is typically 5-10 times the number of observed variables. In this study, the scale included 22 observed variables (comprising 5 Capability, 5 Opportunity, 6 Motivation, and 6 Behavior variables), thus necessitating a minimum sample size of approximately 110 to 220 participants. The survey sample consisted of both domestic and international visitors, selected through convenience sampling, a common method in behavioral research within the field.

A total of 895 valid questionnaires were collected (321 in Ha Long, 320 in Sam Son, and 254 in Cu Lao Cham - Hoi An), fulfilling statistical requirements and enhancing reliability and generalizability. The survey was conducted during Viet Nam's peak tourist months from May to July 2025 to accurately capture tourist behavior at the destinations. Data collection involved face-to-face interviews using printed questionnaires, conducted by the three authors of this study. Participants were informed of the study's purpose and granted the right to decline participation. Each interview lasted approximately 10 min, and the collected data were entered into SPSS software, where it was cross-checked for accuracy.

2.4. Data Analysis

Data was processed using SPSS 28.0 statistical software. The analysis procedures included the following steps:

- Descriptive statistics to present sample characteristics and common behavioral trends,

- ii. Reliability testing of the measurement scales using Cronbach's Alpha coefficient, with an acceptance threshold of ≥ 0.70 ,
- iii. Pearson correlation analysis to examine associations between the COM-B components and plastic waste reduction behavior,
- iv. Multiple linear regression analysis was employed to assess the impact of Capability, Opportunity, and Motivation on behavior. This approach was chosen for its straightforward interpretability of predictor weights, which is crucial for evidence-

based policy decisions at the destination level. Although structural equation modeling is useful for examining complex latent pathways, multiple regression remains a robust and appropriate method for identifying behavioral correlates within the scope of this study.

2.5. Research Ethics

The research adheres to the principles of sociological ethics, ensuring that tourists voluntarily consented to participate. All data was kept confidential and anonymous, and the

Table 1: General information of tourists to Viet Nam's coastal destinations.

Demographic information and general travel information		Percentage [%]
Age	15-18	4,5%
	18-30	21,6%
	31-45	28,6%
	46-60	29,8%
	Over 60	15,5%
Gender	Male	51,5%
	Female	48,5%
Tourist type	Domestic	22,9%
	International	77,1%
Education	High school	14,3%
	College	51,8%
	University	25,1%
	Postgraduate	8,7%
Occupation	Student	8,4%
	Civil servant	18,7%
	Worker, farmer	18,0%
	Freelancer	11,6%
	Businessman	26,4%
	Retiree	15,1%
	Other	1,9%
Number of visits to Ha Long Bay	The 1st time	43,7%
	The 2 nd time	39,6%
	The 3rd time	11,2%
	Over 3 times	5,6%
Trip Organization	Self-organized package	52,6%
	Tour package	47,4%
Accommodation	Cruise ship/ hotel/resort 5*	4,6%
	Cruise ship/ hotel/resort 4*	30,4%
	Cruise ship/ hotel 2-3*	42,5%
	Hostel	10,6%
	Appartment	2,8%
	Homestay	9,2%
Average spending/Day	Under 1 million VNĐ	31,8%
	1-2 million VNĐ	40,8%
	2-3 million VNĐ	19,4%
	Over 3 million VNĐ	7,7%

(Source: Synthesized by authors from research results)

information was exclusively used for academic and scientific research purposes.

3. RESULTS

3.1. Survey Sample Characteristics

The study surveyed 895 tourists at 03 representative research sites; the characteristics of the survey sample are described in Table 1.

Regarding gender and age demographics, male tourists constitute 51.5% while females represent 48.5%, with working-age individuals making up the majority. The largest age group is 46-60 years old at 29.8%, followed by 31-45 years at 28.6%, and 18-30 years at 21.6%. Tourists over 60 years old and those aged 15-18 constitute smaller segments, at 15.5% and 4.5%, respectively. Domestically, tourists make up 77.1%, whereas international visitors account for 22.9% (see Fig. 2).

Regarding educational background and occupation, tourists with a college degree constitute the largest group

at 51.8%, followed by university graduates at 25.2%, high school diploma holders at 14.3%, and postgraduates at 8.7%. The occupational profile reveals that the majority work in private enterprises (26.4%), with civil servants/public employees making up 18.7%, workers and farmers 18.0%, retirees 15.1%, freelancers 11.6%, and students 8.4%. This highlights the diverse backgrounds of visitors to the study sites (Fig. 2).

In terms of organization and accommodation, 52.6% of tourists arrange their trips independently, while 47.4% book tours through travel agencies. The most popular hotel category is 2-3 star hotels, chosen by 42.5%, followed by 4-star hotels and resorts at 35%. Daily expenditure mostly ranges from VND 1-2 million (40.8%), less than VND 1 million (31.8%), and VND 2-3 million (19.4%) (Fig. 2).

3.2. PW-Reducing Behavior of Tourists at Viet Nam's Coastal Destinations

Behaviors are assessed through six specific actions (B1 to

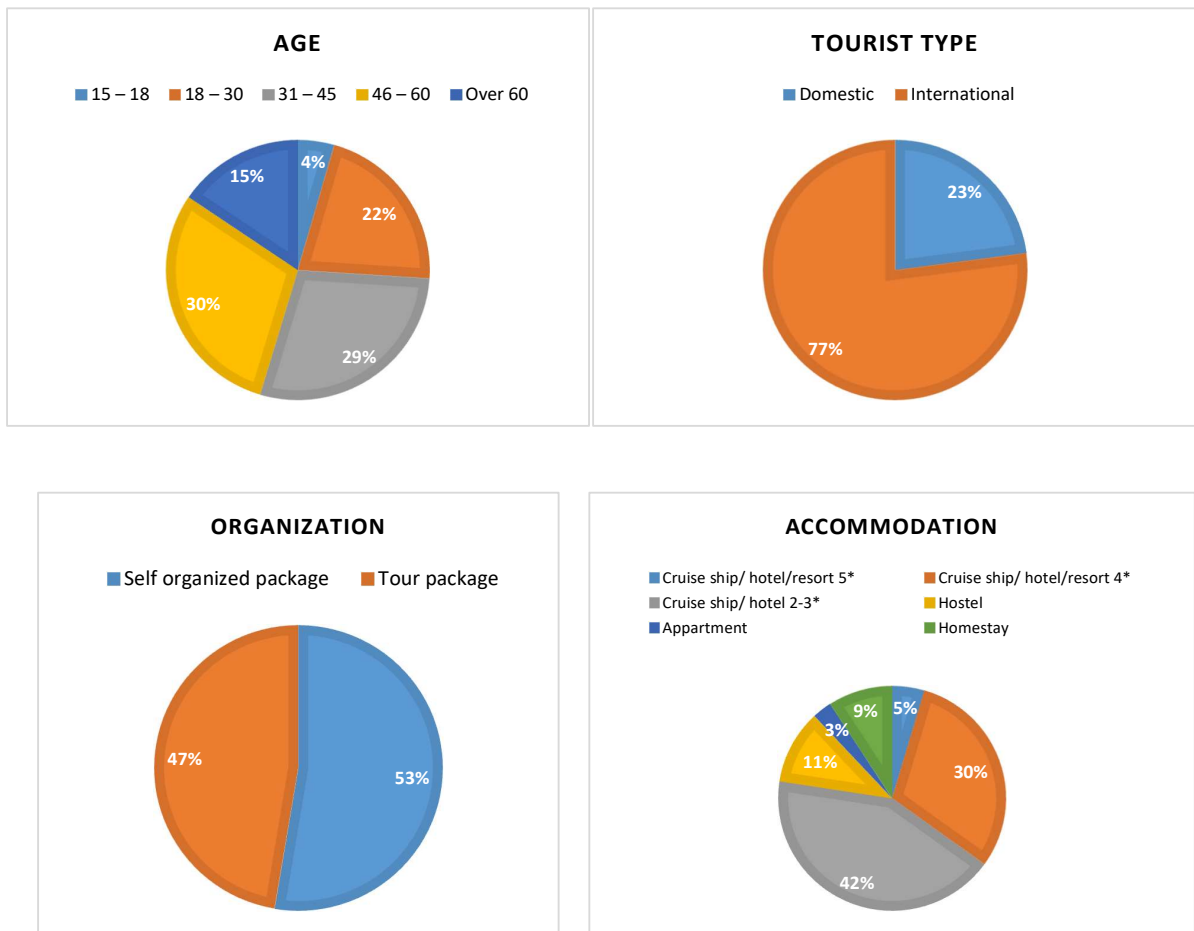


Fig. 2: General information of tourists to Viet Nam's coastal destinations.

B6) outlined in Table 2. The average scores from tourists indicate that the most frequently performed behaviors include bringing personal care items when traveling, using cloth, sedge, or similar bags instead of plastic bags, educating family and community about the harms of plastic waste, and taking measures to reduce plastic consumption, with mean values of 3.80 and 3.79. The overall behavior index, calculated as the average of the six actions, stood at 3.78 on a 5-point scale, reflecting a fairly positive behavioral trend.

Further analysis reveals that 63.9% of tourists often prefer using cloth or sedge bags over plastic ones, 63.6% bring personal care items when traveling, 63.5% sort and dispose of plastic waste properly, 63% educate their family and community about plastic waste harms and reduction strategies, and 61.8% refuse to use plastic straws, spoons, cups, bowls, and chopsticks, instead opting to eat or drink at

restaurants rather than take away. These findings indicate a relatively positive trend toward reducing plastic waste among tourists, especially in Cu Lao Cham - Hoi An, where over 90% of visitors report regularly practicing these behaviors.

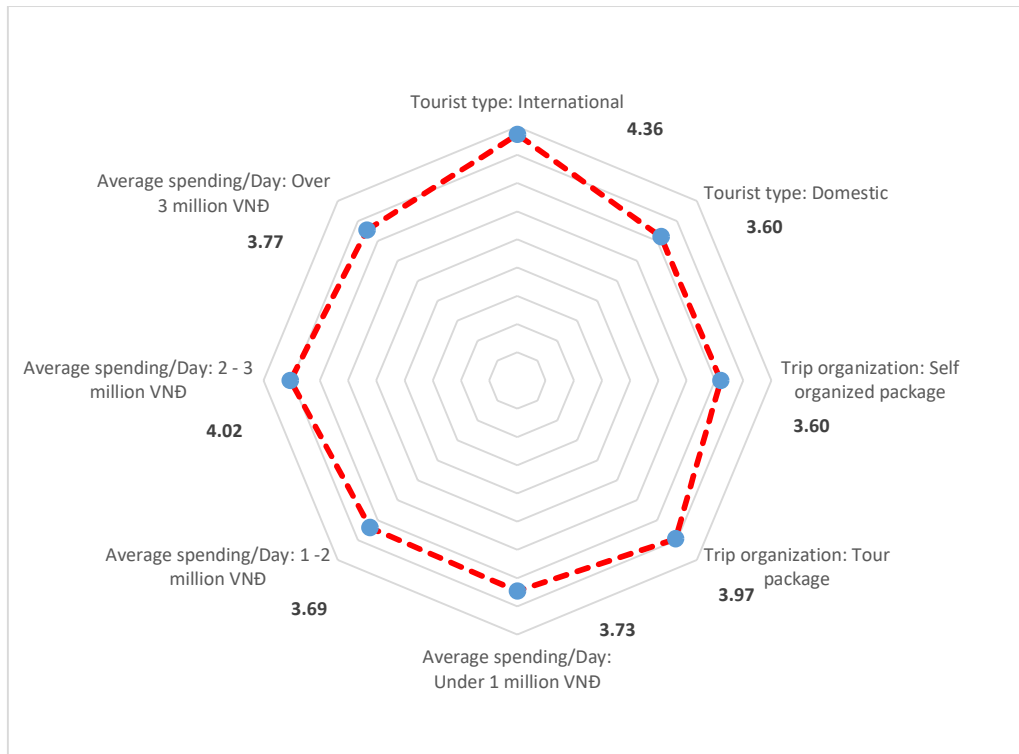
Using one-way ANOVA analysis and a t-test to examine the differences in PW reduction behavior of tourists according to different categories shows that:

- *By tourist type (domestic and international tourists):* A statistically significant difference was found in plastic waste reduction behaviors between domestic and international tourists, as demonstrated by the independent samples T-test (both the F-test and T-test p-values were below 0.05). International tourists exhibited a higher overall behavioral score (mean = 4.36) compared to domestic tourists (mean = 3.60) (see Fig. 3). The gap was especially notable for actions requiring greater personal initiative, such as bringing

Table 2: PW reduction behavior of tourists at Viet Nam's coastal destinations.

		B1	B2	B3	B4	B5	B6	Mean
		Mean	Mean	Mean	Mean	Mean	Mean	
Tourist type	International	4,36	4,37	4,32	4,39	4,35	4,38	4,36
	Domestic	3,63	3,61	3,61	3,62	3,57	3,57	3,60
	Total	3,80	3,79	3,77	3,79	3,75	3,75	3,78
Age	15-18	4,15	4,03	3,88	3,88	3,88	3,95	3,96
	18-30	3,81	3,74	3,87	3,80	3,79	3,77	3,80
	31-45	3,80	3,82	3,73	3,82	3,68	3,73	3,76
	46-60	3,70	3,73	3,72	3,73	3,72	3,75	3,72
	Over 60	3,85	3,83	3,78	3,84	3,84	3,73	3,81
Education	High school	3,80	3,84	3,89	3,80	3,82	3,84	3,83
	College	3,79	3,83	3,75	3,83	3,75	3,79	3,79
	University	3,83	3,70	3,76	3,73	3,72	3,67	3,74
	Postgraduate	3,74	3,64	3,74	3,71	3,73	3,67	3,71
Occupation	Student	3,84	3,87	3,84	3,69	3,75	3,73	3,79
	Civil servant	3,83	3,89	3,75	3,81	3,77	3,71	3,79
	Worker/ farmer	3,67	3,76	3,72	3,81	3,72	3,67	3,73
	Freelancer	3,71	3,78	3,69	3,78	3,62	3,83	3,73
	Businessman	3,82	3,77	3,82	3,78	3,73	3,82	3,79
	Retiree	3,91	3,70	3,77	3,81	3,87	3,76	3,80
	Others	3,76	3,59	3,94	4,12	3,94	3,71	3,84
Trip organization	Self-organized package	3,59	3,63	3,61	3,63	3,56	3,58	3,60
	Tour package	4,02	3,96	3,95	3,97	3,96	3,95	3,97
Average spending/Day	Under 1 million VNĐ	3,75	3,79	3,73	3,73	3,65	3,74	3,73
	1 -2 million VNĐ	3,72	3,68	3,70	3,70	3,68	3,66	3,69
	2 - 3 million VNĐ	4,06	3,98	3,97	4,06	4,06	3,98	4,02
	Over 3 million VNĐ	3,70	3,86	3,78	3,87	3,71	3,72	3,77

(Source: Synthesized by authors from research results)



(Source: Synthesized by authors from research results)

Fig. 3: Differences in PW reduction behavior among tourist groups visiting Viet Nam's coastal destinations.

personal care items, refusing single-use plastics like straws, spoons, cups, bowls, and chopsticks, and opting to dine on-site rather than take away.

- *By trip organisation:* The average behavioral score for tourists who booked organized tours was 3.97, exceeding the 3.60 score of independent travelers (Fig. 3). Statistical analysis using the independent samples T-test confirmed that this difference was significant, with both the F-test and T-test p-values below 0.05.
- *By age, education and occupation:* The ANOVA One-Way analysis indicates no significant difference in PW reduction behavior among tourist groups of different ages, education levels, or occupations (F test significance > 0.05).
- *By Average spending/Day:* One-way ANOVA results reveal a statistically significant variation in plastic waste reduction behavior among tourist groups with different daily spending levels (Sig. = 0.000). Notably, tourists spending an average of 2-3 million VND per day exhibited the highest mean behavioral score of 4.02 (Fig. 3).

3.3. Factors Affecting Tourists' PW Reduction Behavior at Viet Nam's Coastal Destinations

3.3.1. Testing the Reliability of the Scales

To evaluate the reliability of the scales within the COM-B model, the study employs Cronbach's Alpha coefficient. The findings indicate that all scales demonstrate acceptable reliability (see Table 3). Specifically, the Capability scale yields a Cronbach's Alpha of 0.791 across 5 observed variables, the Opportunity scale shows an Alpha of 0.773 with 5 variables, the Motivation scale achieves an Alpha of 0.826 with 6 variables, and the Behavior scale registers an Alpha of 0.820 with 6 variables.

With Cronbach's Alpha values greater than 0.7, the scales are reliable and are used in correlation and multiple linear regression analyses.

Table 3: Testing the reliability of scales in the COM-B model.

	Cronbach's Alpha	N of Items
Capability	0.791	5
Opportunity	0.773	6
Motivation	0.826	6
Behavior	0.820	6

(Source: Synthesized by authors from research results)

Table 4: Pearson correlation analysis in the COM-B model.

Correlations		B Average	C Average	O Average	M Average
B Average	Pearson Correlation	1	.780**	.774**	.820**
	Sig. (2-tailed)		.000	.000	.000
	N	895	895	895	895
C Average	Pearson Correlation	.780**	1	.744**	.775**
	Sig. (2-tailed)	.000		.000	.000
	N	895	895	895	895
O Average	Pearson Correlation	.774**	.744**	1	.786**
	Sig. (2-tailed)	.000	.000		.000
	N	895	895	895	895
M Average	Pearson Correlation	.820**	.775**	.786**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	895	895	895	895

**. Correlation is significant at the 0.01 level (2-tailed).

(Source: Synthesized by authors from research results)

3.3.2. Correlation analysis (Pearson)

The study uses Pearson correlation analysis to examine the relationship between variables in the COM-B model and actual behavior (Table 4).

The results from Pearson correlation and linear regression analyses within the COM-B model reveal that Capability, Opportunity, and Motivation are all significantly associated with and influence plastic waste reduction behavior (Behavior) at the 1% significance level ($p < 0.01$). Specifically, Pearson correlation indicates a strong positive relationship between Capability and behavior ($r = 0.780$), suggesting that individuals with enhanced knowledge and skills tend to engage more actively in reducing plastic waste. Motivation also exhibits a very strong positive correlation ($r =$

0.820), emphasizing that personal motivation is a vital factor driving environmentally conscious actions. Additionally, Opportunity shows a significant positive correlation ($r = 0.774$), implying that supportive environmental conditions and external assistance can promote proactive behaviors among tourists.

Among the independent components of the COM-B model, correlations are also positive and statistically significant ($p < 0.01$), with coefficients ranging from 0.744 to 0.786. This pattern suggests that individuals with higher capability are more motivated and more likely to utilize external opportunities. All absolute correlation coefficients are below 0.85, indicating an absence of severe multicollinearity among the variables. Nonetheless, to ensure

Table 5: Multiple linear regression analysis in the COM-B model.

Model Summary ^b							
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson		
1	.455 ^a	.743	.743	.31135	1.938		
a. Predictors: (Constant), M average, C average, O average							
b. Dependent Variable: B average							
Coefficients ^a							
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-.009	.077		-.120	.904		
Mean C	.292	.030	.281	9.846	.000	.352	2.838
Mean O	.248	.030	.240	8.188	.000	.336	2.976
Mean M	.441	.033	.413	13.349	.000	.301	3.322

a. Dependent Variable: B Average

(Source: Synthesized by authors from research results)

the robustness of the model, further analysis using linear regression and Variance Inflation Factor (VIF) tests should be performed to confirm the extent of multicollinearity.

3.3.3. Multiple Linear Regression Analysis

The study conducted multiple linear regression analysis to determine the influence level of each factor (Capability, Opportunity, Motivation) on PW reduction behavior (Table 5).

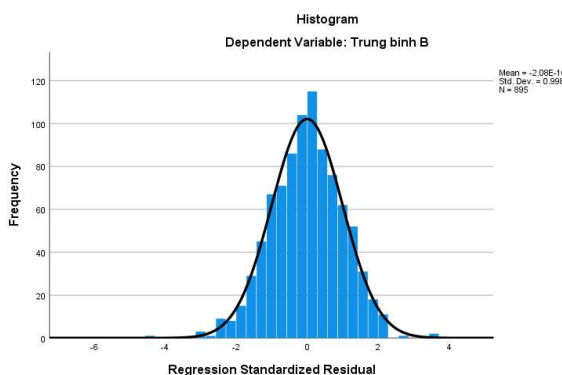
The multiple linear regression analysis reveals that the COM-B model accounts for approximately 74.3% of the variation in behavior ($R^2 = 0.743$). This represents a substantial explanatory power in behavioral research, highlighting a strong link among Capability, Opportunity, and Motivation in shaping tourists' behavior. The standard error of the estimate is 0.311, which is lower than the typical standard deviation of 0.6 to 0.8 on a 5-point Likert scale, indicating a good fit of the model to the data. Additionally, the Durbin-Watson statistic of 1.938 falls within the acceptable range of 1.5 to 2.5, suggesting there is no

significant autocorrelation in the residuals and that the linear regression assumptions are satisfied (Field 2009).

The analysis of individual predictors shows that all independent variables exert positive and statistically significant effects on behavior ($p < 0.001$). Motivation demonstrates the strongest influence ($\beta = 0.413$), underscoring the vital role of internal drive, beliefs, and personal commitment in shaping behaviors. Capability ($\beta = 0.281$) ranks second, indicating that knowledge, skills, and the ability to perform behaviors significantly impact outcomes. Opportunity ($\beta = 0.240$) also positively affects behavior, highlighting the importance of environmental factors, policy support, and available resources in fostering engagement.

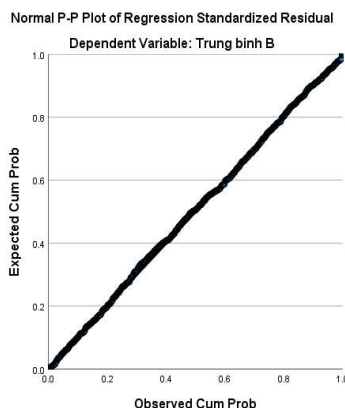
The multicollinearity test reveals all VIF values are below 5 (ranging from 2.838 to 3.322), indicating no multicollinearity issues among the predictors.

Residual analysis shows that the mean residual is near zero and its standard deviation aligns with the model's



(Source: Synthesized by authors from research results)

Fig. 4. Histogram of regression standardized residual.



(Source: Synthesized by authors from research results)

Fig. 5. Normal PP plot of Regression standardized residual.

standard error, confirming that the normality assumption is satisfied (Fig. 4 & Fig. 5).

Based on the analysis, the standardized regression equation is as follows:

$$B = 0.281C + 0.240O + 0.413M$$

Keys of Interpretation:

B: Tourist behavior score relating to PW reduction (B Mean)

C: Capability

M: Motivation

O: Opportunity

The regression equation reveals that all three elements of the COM-B model—Capability, Opportunity, and Motivation—positively influence tourist behavior. Motivation has the most significant impact ($\beta = 0.413$), indicating that internal psychological factors are crucial in encouraging and sustaining sustainable practices. Additionally, Capability and Opportunity also exert meaningful positive effects, suggesting that improving knowledge, skills, and environmental support can further foster reductions in plastic waste.

4. DISCUSSION

4.1. Overview of Results and Comparison with Theory

The results confirm that the COM-B model offers a strong theoretical foundation for understanding tourists' behaviors in reducing plastic waste. Additionally, the relative importance of its components highlights a notable dependence on individual willpower within Viet Nam's coastal regions. While Motivation, Capability, and Opportunity all have significant positive effects, the predominant influence of Motivation ($\beta = 0.413$) indicates that current behavioral shifts are mainly fueled by internal psychological commitment rather than external systemic factors.

This finding offers a deeper insight into the intention-behavior gap, a subject extensively explored within environmental psychology. In contrast to traditional models such as the Theory of Planned Behavior (TPB) and the Value-Belief-Norm (VBN) model (Ajzen 1991, Stern 2000), which mainly highlight internal motivations as the primary drivers of behavior, the COM-B model (Michie et al. 2011) presents a more detailed understanding of how these internal factors interact with external situational barriers. The observation that Motivation emerges as the most significant predictor indicates the presence of a compensatory mechanism. Considering the insufficient and poorly coordinated infrastructure at Viet Nam's coastal

destinations, tourists are compelled to rely on higher levels of personal commitment to surmount physical barriers to plastic waste reduction. This suggests that pro-environmental behavior in this setting remains at a stage where substantial individual effort is required, with tourists actively seeking ways to minimize plastic waste rather than benefiting from supportive environmental conditions (Bandura 1986, Hines et al. 1987).

Furthermore, the relatively limited influence of Opportunity ($\beta = 0.240$) highlights a structural bottleneck. Although Opportunity remains an important prerequisite for behavior, its lower coefficient compared to Motivation and Capability indicates an imbalance between tourists' willingness to reduce plastic waste and the level of destination support. In many tourism contexts in developed countries, Opportunity often acts as the main driver due to well-established waste management systems and infrastructure (Allison et al. 2022, Prawira et al. 2024). However, at the studied locations, the modest impact of Opportunity suggests that the existing infrastructure alone is insufficient to foster behavioral change without strong personal motivation.

The strong influence of Capability ($\beta = 0.281$) underscores the importance of environmental literacy and practical knowledge as key drivers of behavioral change. This aligns with social cognitive theory, which posits that individuals' belief in their abilities (self-efficacy) is a critical prerequisite for action (Tabernero & Hernández 2011). Additionally, the findings suggest that in resource-limited settings, tourists need specific practical knowledge to turn their intentions into actual behaviors and to effectively navigate the lack of supportive infrastructure at the destination (Frick et al. 2004, Hines et al. 1987).

Overall, this study shows that enhancing tourists' plastic waste reduction behaviors at Viet Nam's coastal destinations mainly relies on increasing individual motivation and capability, while also boosting external environmental support. Therefore, interventions aimed at behavioral change should take a comprehensive approach that improves tourists' environmental knowledge and skills, encourages intrinsic motivation, and enhances infrastructure and policy mechanisms to sustain behavioral change.

4.2. Analysis by Tourist Group

The results demonstrate that tourists' plastic waste reduction behavior varies significantly across different tourist segments, reflecting differences in Capability, Opportunity, and Motivation, as conceptualized in the COM-B model.

International tourists reported a significantly higher mean behavioral score (4.36) than domestic tourists (3.60),

indicating higher levels of Capability and Motivation. This finding suggests that international visitors often possess stronger environmental knowledge and more deeply internalized pro-environmental norms, enabling them to maintain plastic waste reduction practices even when destination infrastructure is limited. These findings are consistent with previous studies showing that travelers from developed countries tend to participate more actively in pro-environmental behaviors during their trips (Barr et al. 2010, UNEP 2018, Shamsub & Lebel 2012, Dolničar & Grün 2008). Rather than suggesting that international tourists exhibit uniform behavioral patterns, these results highlight the interaction between individual characteristics and contextual factors in shaping plastic waste reduction behavior.

The difference between tourists traveling on organized tours (3.97) and independent travelers (3.60) seems primarily linked to the Opportunity component. Organized tours tend to offer a more supportive physical and social environment, where information, guidance, and plastic-free alternatives are systematically integrated into the travel experience and easily accessible. These arrangements help bridge the gap between environmental awareness, behavioral intentions, and actual practices—a common challenge for independent travelers who lack external support. This aligns with prior research indicating that organized tour settings can foster environmentally responsible behaviors by providing clear guidance and structured opportunities for action (Shamsub & Lebel 2012). However, this interpretation should be approached with caution, as the current study did not directly investigate the mechanisms driving this relationship.

Furthermore, tourists' spending levels demonstrate the interaction between Motivation and Opportunity. The highest average behavioral score (4.02) was recorded among tourists spending between 2 and 3 million VND, indicating a synergistic effect between their willingness to pay for sustainable options (Motivation) and increased access to tourism services that feature environmentally friendly facilities and infrastructure (Opportunity). This aligns with previous research showing that higher-spending tourists typically have better access to sustainable alternatives and are more willing to pay a premium for eco-friendly products and services (Dolničar & Leisch 2008, Han et al. 2010).

Conversely, the lack of statistically significant differences across age groups, education levels, and occupations indicates that situational factors and specific motivational elements more influence plastic waste reduction behaviors at the study destinations than by overarching demographic characteristics. Overall, these results highlight the necessity of implementing targeted behavioral interventions. Strategies

aimed at decreasing plastic waste should prioritize enhancing the Capability and Motivation of domestic tourists while also improving Opportunity—through upgraded infrastructure, better information dissemination, and a more supportive social environment—especially for independent travelers and lower-spending tourist groups.

4.3. Recommendations for Destination Policy and Management

From the above results, the study gives some important implications for policy development and sustainable tourism destination management in coastal tourist areas in Viet Nam:

Prioritize capability building for groups with limited behavioral skills: Enhancing the ability to perform green behaviors should be regarded as a fundamental step, particularly for domestic and independent tourists. Strategies include encouraging communication, environmental education, installing visual guidance tools at destinations such as information boards, QR codes, videos, and digital apps, as well as training tour guides, service staff, and local communities to act as ambassadors for eco-friendly practices. These initiatives not only boost knowledge and skills but also simplify behavior adoption and integrate it into the tourism experience.

Improve the effectiveness of behavioral support conditions: The results demonstrate that the opportunity factor positively influences behavior, indicating that when tourists are provided with adequate resources and supportive policies, plastic reduction efforts are significantly enhanced. Therefore, it is essential to invest in developing and harmonizing infrastructure systems that promote environmental protection, such as PW-classified trash bins, public water stations, plastic-free accommodations and restaurants, and clear waste management guidelines. Additionally, establishing criteria for “plastic-free destinations” and implementing mechanisms to incentivize businesses to adopt green standards will help create a sustainable ecosystem that encourages eco-friendly behaviors.

Promote motivation through encouraging personal values: Motivation is the key to sustaining and promoting eco-friendly behaviors. Destination management should prioritize appealing to personal values and social responsibility, such as through campaigns that highlight tourists' roles in conserving natural and cultural heritage. Recognizing positive actions with “Green Tourist” badges, providing discounts for guests who bring their own water bottles, and eliminating disposable plastics in hotels can reinforce good habits. Additionally, hosting photo contests and encouraging plastic-free check-ins can significantly boost mental motivation.

Promote the role of travel agencies and tour guides: The behavioral differences between tour buyers and independent travelers indicate that travel agencies can play a key role in managing these variations. Therefore, it is essential to encourage and empower travel agencies and tour guides to incorporate PW-reduction rules into their itineraries. This can be achieved by offering alternative items, providing waste sorting guidance, and motivating tourists throughout the journey.

Develop a tourism product tailored to the tourist segment and spending level: Tourists with an average daily spend of 2-3 million VND show more positive behavior, highlighting the connection between financial Capability, awareness, and willingness to pay for sustainable experiences. The destination management board should design diverse green tourism products tailored to spending levels, while strengthening flexible pricing policies, certifying environmentally friendly products, and communicating responsible consumption.

Develop a multi-channel communication strategy: craft messages and channels that align with the characteristics of tourist markets. For international tourists, messages about global heritage and environmental protection can be maintained. For domestic tourists, education programs need to be developed to raise awareness and encourage early practice, perhaps through schools or community campaigns.

4.4. Research Limitations and Development Directions

Despite the theoretical and practical significance of the findings, this study has several limitations that should be acknowledged.

Although the sample size of 895 participants was relatively large, which enhanced the robustness of the statistical analysis, the use of convenience sampling may limit the generalizability of the findings to the broader population of tourists visiting coastal destinations in Viet Nam. Future research should consider employing probability-based or stratified sampling methods to improve sample representativeness and strengthen external validity. Additionally, the study relied primarily on self-reported questionnaires, which are susceptible to social desirability bias, especially when measuring environmentally responsible behaviors. Incorporating qualitative approaches such as in-depth interviews, direct behavioral observations, or field experiments could provide a more accurate understanding of tourists' plastic waste reduction behaviors. The COM-B model showed strong explanatory power with an R^2 of 0.743, indicating significant associations among Capability, Opportunity, Motivation, and plastic waste reduction behavior.

However, pro-environmental behavior is inherently complex and influenced by other factors like social norms, emotions, environmental beliefs, and reference group influences. Since all variables were measured using a single self-report questionnaire, the potential for common method bias and social desirability bias cannot be entirely excluded, especially given the environmental focus and face-to-face data collection. Furthermore, multiple linear regression does not explicitly account for measurement error or examine complex causal relationships among latent constructs.

Future research could expand the analytical framework by combining the COM-B model with additional behavioral theories such as the Theory of Planned Behavior (Ajzen 1991), the Norm Activation Model (Schwartz 1977), and the Value-Belief-Norm framework (Stern 2000). Using advanced techniques like structural equation modeling would also enable a more comprehensive understanding of these relationships. Lastly, plastic waste reduction behavior was operationalized as a composite index based on various self-reported behaviors that differ in effort and social context. As a result, the analysis reflects overall behavioral tendencies rather than specific behavioral dimensions. Future studies might employ exploratory or confirmatory factor analysis to explore the underlying structure of tourists' plastic waste reduction behaviors.

5. CONCLUSIONS

Amidst the growing urgency for sustainable tourism development and marine environmental preservation, this study offers valuable empirical evidence on tourists' plastic waste reduction behavior at Viet Nam's coastal tourism sites. Based on a survey of 895 tourists and utilizing the COM-B model, multiple linear regression results revealed that the model accounted for 74.3% of the variation in plastic waste reduction behavior ($R^2 = 0.743$), demonstrating the strong applicability of the COM-B framework in tourism behavioral research.

Among the three components influencing behavior, Motivation exerts the most significant effect ($\beta = 0.413$), followed by Capability ($\beta = 0.281$) and Opportunity ($\beta = 0.240$). All factors have positive and statistically significant impacts ($p < 0.001$). This suggests that tourists' plastic waste reduction actions are influenced not only by their knowledge and skills but also by psychological factors and the support infrastructure available at destinations.

Furthermore, ANOVA results indicated notable differences among tourist groups. International visitors exhibited more environmentally responsible behavior than domestic travelers, and tour buyers scored higher than independent tourists. Additionally, tourists with a

daily expenditure of 2-3 million VND demonstrated more positive behaviors. These findings highlight the importance of capability, motivation, access conditions, and financial capacity in fostering sustainable tourism behaviors.

Based on these insights, the study affirms that the COM-B model is both a valuable theoretical tool and an effective aid for destination management policy formulation. By targeting the three pillars—Capability, Opportunity, and Motivation—strategies can be developed to influence behavior, such as enhancing tourists' knowledge and skills through education and information campaigns, improving infrastructure and services that support eco-friendly actions, motivating individuals via social recognition and incentives, and leveraging travel businesses to guide sustainable practices.

Nevertheless, the study has limitations, including the use of a convenience sample, reliance on self-reported data, and focus on limited destinations. Future research should broaden the scope, integrate both qualitative and quantitative methods, and apply more advanced theoretical models to obtain a deeper understanding of tourists' plastic reduction behaviors.

In conclusion, this study advances understanding of tourists' plastic waste reduction behavior. The evidence-based recommendations derived from the COM-B model provide a solid foundation for policymakers and destination managers to implement effective interventions aimed at promoting sustainable tourism and marine conservation in Viet Nam. Additionally, the research opens avenues for further investigations involving different populations, locations, and methodological approaches to build a more comprehensive behavioral framework.

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