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

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Abstract: Plastic waste generated by tourism activities poses increasing environmental pressure on coastal destinations in Viet Nam. Understanding tourists' plastic waste reduction behavior is therefore essential for designing effective destination-level interventions. This study applies the COM-B framework to examine the influence of Capability, Opportunity, and Motivation on tourists' plastic waste reduction behavior at selected coastal destinations in Viet Nam. Data were collected through a structured questionnaire survey of 895 tourists and analyzed using descriptive statistics, reliability testing, correlation analysis, and multiple linear regression. The results indicate that Motivation exerts the strongest influence on plastic waste reduction behavior, followed by Capability, while Opportunity shows a weaker effect. The model explains a substantial proportion of behavioral variance (R^2 = 0.743), suggesting strong associations between the COM-B components and self-reported behaviors. The findings contribute to the empirical application of the COM-B framework in a coastal tourism context and provide practical implications for policymakers and destination managers seeking to promote plastic waste reduction among tourists.

1. INTRODUCTION

Plastic waste (PW) has become one of the biggest environmental challenges globally, especially in coastal and marine tourism destinations. According to the United Nations Environment Programme (UNEP, 2021), approximately 11 million tons of plastic leak into the ocean annually and this figure could double by 2040 if humans do not implement effective interventions. The convenient items such as water bottles, cups, bags, knives, spoons, forks, etc. which are made of single-use plastic often account for a large proportion of PW (Kong et al., 2023), (Maione, 2021), (Bauske and von Münchhausen, 2019). They also cause visual pollution, threat marine ecosystems and negatively impact the tourism industry (OECD, 2024), (Jang et al., 2015) (McIlgorm et al., 2011).

The Southeast Asia currently generates approximately 31 million tons of PW per year (2023), of which more than 60% comes from single-use plastic packaging and products (OECD, 2025). The tourism industry has been identified as one of the major sources, especially during peak seasons, when PW at coastal destinations can increase to 40% of total solid waste (Truong et al., 2023), (Kong et al., 2023), (Hu et al., 2024), (Pandey et al., 2022).

Viet Nam is among the five Southeast Asian countries with a relatively high per capita rate of PW generation, at about 25 kg/person/year, and is expected to increase to 79 kg/person/year by 2050 (OECD, 2025). In Viet Nam, the roadmap to limit and ban single-use plastic products has been stipulated in legal documents such as the Law on Environmental Protection (2020), Decree No. 08/2022/ND-CP (2022) and Decision No. 1746/QD-TTg of the Prime Minister (2019). Accordingly, from January 1, 2026, the use of non-degradable plastic bags and single-use plastic products will be banned in supermarkets and shopping malls; for hotels and tourist areas, this will take effect after 2030. Reducing plastic at the source, encouraging the application of sustainable tourism standards, and changing tourists' consumer behavior are also key. However, for the policy to be effective, in-depth studies on tourists' PW-reduction behavior in specific contexts are needed.

Previous research on pro-environmental behavior has commonly applied behavioral frameworks such as the Theory of Planned Behavior (TPB) (Ajzen, 1991) and the Value-Belief-Norm (VBN) framework (Stern, 2000), which primarily focus on attitudes, norms, and behavioral intentions. While these approaches have generated important insights, they tend to place less emphasis on contextual and structural conditions that enable or constrain behavior. To address these limitations, the COM-B model (Michie et al., 2011) conceptualizes behavior as the result of the interaction between three components: Capability, Opportunity, and Motivation, thereby providing an integrated perspective and more distinct intervention guidance. Due to these attributes, COM-B has seen increasing application in studies of 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, especially in research focusing on plastic waste reduction behavior at coastal destinations. Existing literature suggests that COM-B is primarily applied in specific interventionist tourism contexts, such as regulating and dispersing visitor flows through technological solutions or promoting the adoption of innovations in tourism experiences (Wells et al., 2022). While these studies demonstrate the potential of COM-B to support the design and evaluation of behavioral interventions, they also reflect a narrow, situational scope of application. Furthermore, most research on pro-environmental tourist behavior continue to focus on isolated behavioral components or specific tourist

segments, rather than providing an integrated analysis of behavioral formation mechanisms (Prawira et al., 2024). Tourism studies indicate that sustainable behavior is frequently approached through attitudes, intentions, or social norms, while the interactive relationship between individual capability and the destination context has yet to be fully elucidated (Dolničar and Grün, 2008), (Dolničar and Leisch, 2008). Moreover, empirical evidence from developing countries and emerging tourism destinations remains scarce.

These gaps suggest the need for context-sensitive studies that apply integrative behavioral frameworks to better understand tourist behavior relating to plastic waste reduction. On this basis, this study examines tourists' behavior to reduce plastic waste at three representative coastal destinations in Viet Nam, including Ha Long (Quang Ninh), Sam Son (Thanh Hoa), and Cu Lao Cham-Hoi An (Da Nang).

By examining how these components relate to plastic waste reduction across diverse tourist groups, the study refines the boundary conditions of behavioral theory. This positioning shifts the focus from purely psychological drivers to a holistic understanding of how external constraints influence sustainable practices in emerging economies.

2. MATERIALS AND METHODS

2.1. Research location

The study was conducted at three typical coastal destinations in Viet Nam, each welcoming millions of tourists annually. Among them, Sam Son represents mass tourism destinations, primarily attracting domestic tourists in the medium - and lowspending segments; Ha Long, with Ha Long Bay recognized as a UNESCO World Natural Heritage Site, represents destinations that attract both international and domestic tourists across medium - and high-spending segments; and Cu Lao Cham-Hoi An, with Hoi An Ancient Town recognized as a UNESCO World Cultural Heritage Site and the Cu Lao Cham-Hoi An Biosphere Reserve, represents a relatively high-end destination that attracts international tourists with high payment capability.

Fig. 1. Location of study areas
(Source: https://gis.gso.gov.vn)

These destinations implement different PW management practices: while Cu Lao Cham - Hoi An is considered to have relatively effective management, Ha Long and Sam Son still face significant environmental challenges, particularly regarding solid waste and PW.

The survey was conducted in coastal areas, bays, and islands, focusing on high-tourism areas to collect diverse data that accurately reflect tourists' behaviors across various tourism contexts. This approach helps ensure the representativeness of the survey sample and enhances the reliability and generalizability of the research findings.

2.2. Research design

This study uses quantitative methods to determine the influence of three groups of factors in the COM-B model on tourists' PW reduction behavior. According to this model, a behavior can occur when people have enough capability, favorable opportunities to perform and have motivation to promote that behavior (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 one of the most widely used theoretical frameworks for designing effective behavioral interventions. COM-B analyzes behavior according to three core elements:

The first element of the COM-B model is Capability, which is reflected in tourists' general level of understanding and awareness of the harmful effects of PW, as well as their ability to distinguish between recycled, reusable, and disposable plastic products. They also need knowledge of PW reduction regulations or the skills to use environmentally friendly products to replace disposable plastic products. Lack of Capability will be a major barrier to implementing PW reduction behaviors ((White et al., 2019).

The second factor is Opportunity, which includes the physical and social opportunities to perform the behavior. Physical opportunities refer to the infrastructure that supports the behavior, such as the presence of waste sorting bins, recycling collection points, or facilities that provide eco-friendly tourism services such as hotels that do not use single-use plastics, restaurants that use paper or bamboo straws, or free drinking water stations where guests can refill their own water bottles. Meanwhile, social opportunities include factors such as positive social pressure from relatives, companions, and the tourism community, cultural norms and sustainable consumption habits of local people; and content and forms of propaganda that encourage reducing plastic at destinations. In addition, local laws or policies, such as bans on nylon bags and the encouragement of waste classification, also create social opportunities for behavior to be formed and maintained (Michie et al., 2011).

The third element is Motivation, which comes in two main forms: reflective and automatic. Reflective motivation involves personal responsibility, beliefs, values, ideals, deliberate choices, and goals. A traveler may have reflective motivation to reduce plastic because they believe their actions will contribute to environmental protection or create a positive image. Meanwhile, automatic motivation includes emotions, habits, or reflexes. If a person has already had a habit of using a personal

water bottle in their daily life, they are more likely to continue this behavior while traveling (Michie et al., 2011). Emotions also play an important role. Many people feel happy and proud when they know that their small actions contribute to a cleaner environment. Conversely, feelings of guilt or shame can also motivate them to change their behavior when they see others not using plastic.

The application of the COM-B model in designing and evaluating tourists' PW-reduction behavior, based on the three factors outlined above, is a systematic approach. This allows the research team to identify barriers, promote conditions, and develop effective intervention solutions to reduce PW.

The research team designed a questionnaire to collect data based on the COM-B model and referred to previous studies on sustainable consumption behavior (Michie et al., 2011), (Schultz, 2014). The questionnaire is structured with questions divided into 05 main parts, including: (i) Demographic information and general information about the trip; (ii) Capability Information; (iii) Opportunity Information; (iv) Motivation Information; (v) Behavior Information. To measure the level of expression of each factor (COM) and PW reduction behavior (B) of tourists, the study uses a 5-level Likert scale, which is a popular tool in sociological, psychological and behavioral science studies (Likert, 1932).

- Demographic and trip-related information was collected using nine items covering age, gender, nationality, education, occupation, type of tour organization, number of visits to Ha Long Bay, length of stay, and type of accommodation.

- Capability was a latent construct measured by five observed items (C1-C5), including: C1-Understand the harmful effects of PW on the environment and humans; C2-Distinguish between recyclable, reusable plastic products and disposable plastic products; C3-Know products that can replace disposable plastic products (paper straws, bamboo; cloth bags, etc.); C4-Have skills to use environmentally friendly products; C5-Know regulations on PW reduction.

- Opportunity was a latent construct measured by six observed items (O1-O6), grouped into physical and social opportunities. Physical opportunities were assessed based on the availability and readiness of tourism infrastructure and services, including: O1-Garbage bins for collecting and separating PW; O2-Food/beverage shops that do not use SUP; O3-Hotels that do not use SUP. Social opportunities were evaluated through factors including: O4-Culture and habits of people in using plastic; O5-Content and form of communication to reduce plastic; O6-Availability of information guiding tourists on plastic reduction.

- Motivation was a latent construct measured by six observed items (M1-M6), grouped into intrinsic (reflective) and extrinsic (automatic) motivation. Intrinsic motivation was assessed based on personal values, environmental responsibility, and beliefs about behavioral effectiveness, including: M1-Believe that one has the responsibility to protect the environment and reduce plastic; M2-Believe that one's plastic reduction actions can create positive changes; M3-Be willing to change habits to reduce PW, towards green consumption; M4-Concern about whether the destination is

environmentally friendly or not; and M5-Be willing to pay more to use environmentally friendly products. Extrinsic motivation was assessed through emotional responses, specifically: M6-Feel uncomfortable when witnessing PW not being classified, collected separately or being dumped indiscriminately.

- Plastic waste reduction behavior was a latent construct measured by six observed items (B1-B6) capturing the frequency of tourists' self-reported behavioral practices. These items included: B1-Bring personal care items when traveling; B2-Use cloth bags, sedge bags etc. instead of plastic bags; B3-Refuse to use plastic straws, spoons, cups, bowls, chopsticks etc.; B4-Propagate to family and community about the harm of PW and measures to reduce consuming plastic items; B5-Use food/drink in the restaurant instead of taking away; B6-Classify and put PW in the right place. Although these behaviors differ in terms of effort and context, they were included to capture a broad range of self-reported plastic-waste-reduction practices among tourists. The composite behavior score was therefore used to reflect an overall tendency toward plastic waste reduction rather than specific behavioral intensity.

Coastal destinations in Viet Nam attract a large number of international tourists, including many Chinese tourists. Therefore, the questionnaire was translated into English and Chinese to facilitate the interview process. The questionnaire was also piloted with 30 tourists in the Ha Long area, a diverse tourist destination, to edit the language and clarify the meaning before the official survey.

2.3. Subjects, time, location and data collection process

The research subjects were tourists aged 15 or older who stayed for at least 1 day. The sample size was determined based on principles of sociological and behavioral research. In linear regression, the minimum sample size needed was 5-10 times the number of observed variables (Hair et al., 2019). In this study, the scale had 22 observed variables (5 Capability variables, 5 Opportunity variables, 6 Motivation variables, 6 Behavior variables), so the minimum sample size required was about 110 - 220. The survey sample included both domestic and international customers, selected using convenience sampling, a method commonly used in behavioral research in 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), ensuring statistical requirements and increasing reliability and generalizability.

The survey was conducted during the 3 peak tourist months in Viet Nam, from May to July 2025, to ensure representativeness of actual tourist behavior at the destination.

The survey was conducted through face-to-face interviews using a printed questionnaire, and the investigators were the 03 authors of this study. All tourists who answered the questionnaire were informed about the study's purpose and had the right to refuse to participate. On average, each survey took about 10 minutes to complete. The data was then entered into SPSS software and cross-checked to ensure accuracy.

2.4. Data analysis

Data were processed using SPSS 28.0 statistical software. The analysis procedures included

the following steps:

i. 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 utilized to determine the influence of Capability, Opportunity, and Motivation on behavior. This method was selected for its direct interpretability of predictor weights, which is essential for evidence-based policy formulation at the destination level. While structural equation modeling is effective for testing complex latent pathways, multiple regression remains a robust and appropriate technique for determining behavioral correlates within the applied scope of this study.

2.5. Research ethics

The research complies with the principles of sociological ethics: tourists were guaranteed the right to voluntarily agree to participate. All information was confidential and anonymous. The data was only 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.

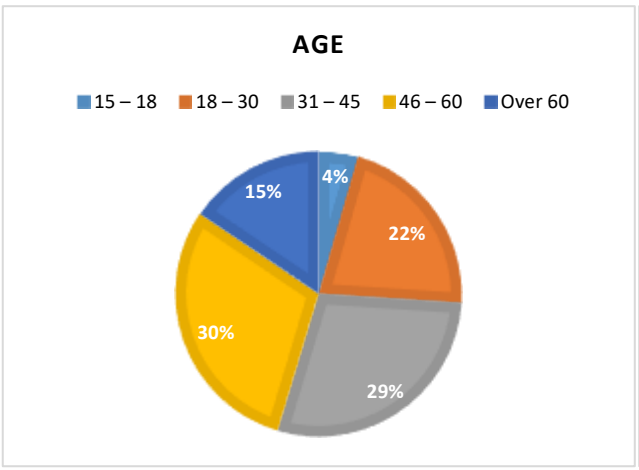
Table 1. General information of tourists to Viet Nam's coastal destinations

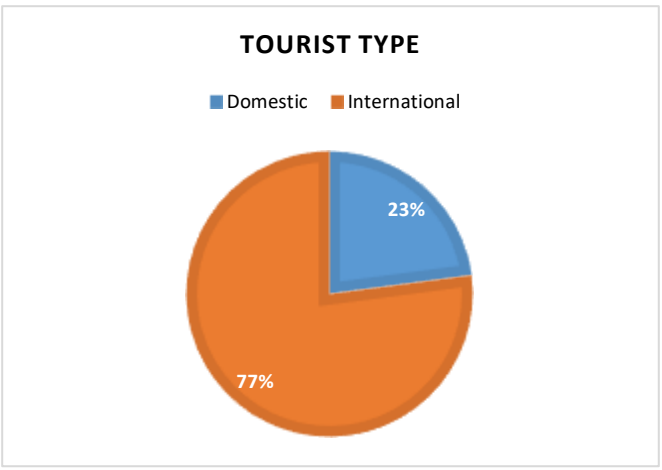
Demographic information and general travel information		Percentage (%)
Age	15 – 18	4,5%
	18 – 30	21,6%
	31 – 45	28,6%
	46 – 60	29,8%
	Over 60	15,5%
Gender	Male	51,5%
	Female	48,5%
Tourist type	Domestic	22,9%
	International	77,1%
Education	High school	14,3%
	College	51,8%
	University	25,1%
	Postgraduate	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%

Demographic information and general travel information		Percentage (%)
	The 2nd 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)

In terms of gender and age, male tourists accounted for 51.5% and female tourists accounted for 48.5%r, working-age tourists predominate. The 46-60 age group accounts for the highest proportion (29.8%), followed by the 31-45 age group (28.6%) and the 18-30 age group (21.6%). Older tourists (over 60 years old) and young tourists (15-18 years old) account for a lower proportion, at 15.5% and 4.5%, respectively. In terms of tourist types, domestic tourists dominate with 77.1%, while international tourists account for 22.9% (Fig. 2).





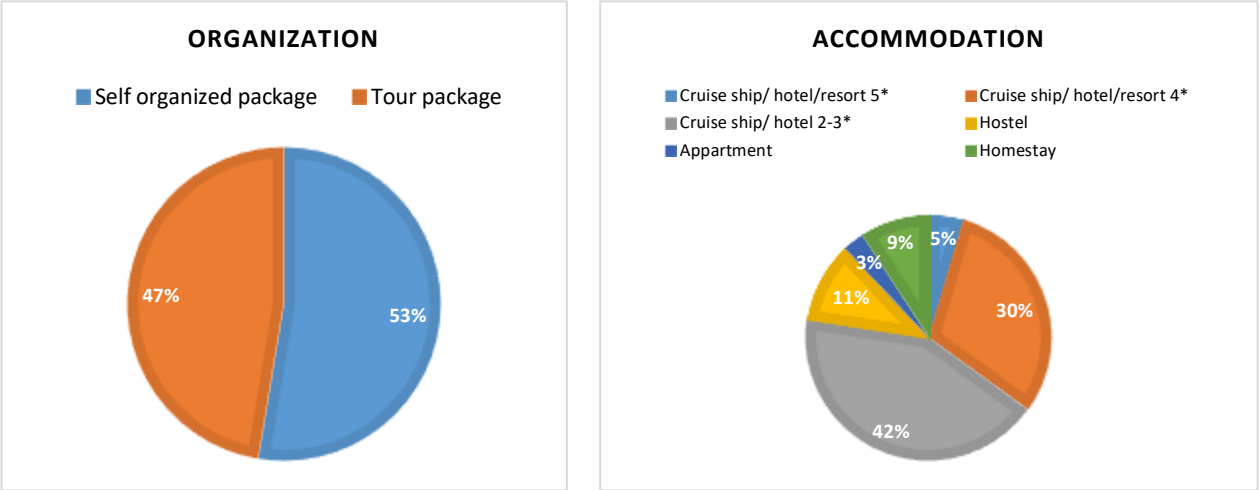


Fig 2. General information of tourists to Viet Nam's coastal destinations.

In terms of educational level and occupation, the group of tourists with college education account for the largest proportion (51.8%), followed by university (25.2%), high school (14.3%) and post-graduate (8.7%). The occupational structure shows that the group working in private enterprises accounts for the highest proportion (26.4%), followed by civil servants/public employees (18.7%), workers/farmers (18.0%) and retirees (15.1%), freelancers (11.6%), and students (8.4%). This shows the diversity of tourists visiting the representative study sites (Fig. 2).

Regarding organization and accommodation, 52.6% of tourists organize tours themselves and 47.4% buy tours from travel agencies. 2-3 star hotels are the most popular choice (42.5%), followed by 4-star hotels/resorts (35%). Average daily spending mainly ranges from VND 1-2 million (40.8%), under VND 1 million (31.8%), and from VND 2-3 million (19.4%) (Fig. 2).

3.2. PW-reducing behavior of tourists at Viet Nam's coastal destinations

Behaviors are measured through 6 specific actions (B1 to B6) described in Table 2. The results of the assessment of the above behaviors by tourists through mean show that bringing personal care items when traveling; use cloth bags, sedge bags etc. instead of plastic bags; propagate to family and community about the harm of PW, and measures to reduce consuming plastic items are performed most frequently by tourists with the corresponding mean values of 3.80 and 3.79. The aggregate behavior index (average of 6 behaviors) reached an average of 3.78 on a 5-point scale, indicating a fairly positive behavioral trend.

The analysis results also show that 63.9% tourists often use cloth bags, sedge bags, etc. instead of plastic bags, 63.6 % bring personal care items when traveling; 63.5% classify and put PW in the right place; 63% propagate to family and community about the harm of PW and measures to reduce consuming plastic items; 61.8% refuse to use plastic straws, spoons, cups, bowls, chopsticks etc and Use food/drink in the restaurant instead of taking away. This shows that the trend of tourists' PW reduction behavior is relatively positive, especially for tourists in Cu Lao Cham - Hoi An, when over 90% of tourists confirmed that they regularly perform the above behaviors.

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)

Using one-way ANOVA analysis and 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 in plastic waste reduction behavior was observed between domestic and international tourists, as indicated by the independent samples T-test (both the F-test and T-test significance values were below 0.05). International tourists reported a higher overall behavioral score (mean = 4.36) compared to domestic tourists (mean = 3.60) (Fig. 3). The differences were particularly pronounced for behaviors requiring higher individual initiative, such as bringing personal care items when traveling, refusing single-use plastic items (e.g., straws, spoons, cups, bowls, and chopsticks), and consuming food and beverages on-site rather than taking them away.

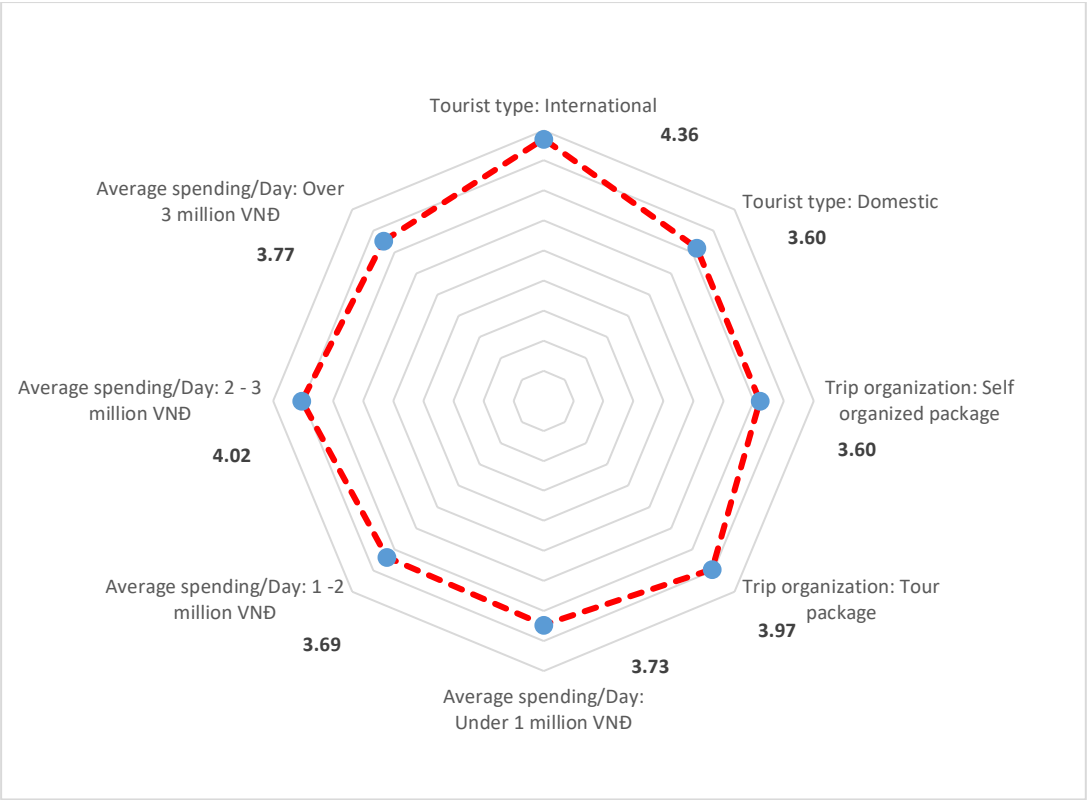


Fig.3. Differences in PW reduction behavior among tourist groups visiting Viet Nam's coastal destinations.

(Source: Synthesized by authors from research results)

- *By trip organisation:* The average behavioral score of tourists who purchased organized tours was 3.97, which was higher than that of independent travelers (3.60) (Fig. 3). The difference between the two groups was statistically significant based on the independent samples T-test, with both the F-test and T-test significance values less than 0.05.

- *By age, education and occupation*: The results of ANOVA - One way analysis shows that there is no difference in PW reduction behavior between tourist groups of different ages, educations and occupations (Sig. of F test >0.05).

- *By Average spending/Day:* One-way ANOVA results indicate a statistically significant difference in plastic waste reduction behavior among tourist groups with different levels of average daily spending (Sig. = 0.000). Among these groups, tourists with an average daily spending of 2-3 million VND recorded the highest mean behavioral score (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 test the reliability of the scales in the COM-B model, the study uses the Cronbach's Alpha coefficient. The results show that all scales have satisfactory reliability (Table 3). Specifically, the Capability scale has a Cronbach's Alpha of 0.791 with 5 observed variables; the Opportunity scale has a Cronbach's Alpha of 0.773 with 5 variables; the Motivation scale has a Cronbach's Alpha of 0.826 with 6 variables; and the Behavior scale has a Cronbach's Alpha of 0.820 with 6 variables.

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)

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

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).

Table 4. Pearson correlation analysis in 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)

The results of the Pearson correlation and linear regression analyses in the COM-B model indicate that the components Capability, Opportunity, and Motivation are all significantly correlated with and influence plastic waste reduction behavior (Behavior) at the 1% significance level ($p < 0.01$). Specifically, the Pearson correlation results indicate that Capability shows a strong positive correlation with behavior ($r = 0.780$), suggesting that individuals with greater knowledge and skills tend to take more proactive steps to reduce plastic waste. Motivation also shows a very strong positive correlation with behavior ($r = 0.820$), confirming that personal motivation is a key driver of environmentally friendly behaviors. In addition, Opportunity exhibits a significant positive correlation with behavior ($r = 0.774$), indicating that favorable environmental conditions and external support can encourage tourists to take more positive actions.

Among the independent components of the COM-B model, there are also positive, statistically significant correlations ($p < 0.01$) with coefficients ranging from 0.744 to 0.786. This suggests that individuals with higher capability often show stronger motivation and are more likely to take advantage of favorable external opportunities. All absolute correlation coefficients are below 0.85, indicating no severe multicollinearity among the independent variables. However, to confirm the model's stability, a linear regression analysis and a VIF test should be conducted to further assess the extent of multicollinearity among the variables.

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).

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 results of the multiple linear regression analysis show that the COM-B model explains approximately 74.3% of the variance in behavior ($R^2 = 0.743$). This is a relatively high explanatory power for behavioral studies, indicating a strong relationship among the three factors Capability, Opportunity, and Motivation in influencing tourists' Behavior. The standard error of the estimate is 0.311, which is smaller than the observed standard deviation (typically 0.6 - 0.8 on a 5-point Likert scale), suggesting that the model fits the data well. The Durbin - Watson statistic (1.938) falls within the acceptable range (1.5-2.5), indicating no significant autocorrelation in the residuals and thus satisfying the linear regression assumption (Field, 2009).

The analysis of individual predictors reveals that all independent variables have positive and statistically significant effects on behavior ($p < 0.001$). Among them, Motivation has the strongest influence ($\beta = 0.413$), highlighting the importance of internal drive, belief, and personal commitment in shaping desired behaviors. Capability ($\beta = 0.281$) ranks second, demonstrating that knowledge, skills, and the ability to perform the behavior substantially affect behavioral outcomes. Opportunity (β

= 0.240) also shows a positive impact, emphasizing the role of environmental conditions, policy support, and available resources in encouraging behavioral engagement.

The multicollinearity test indicates that all VIF values are below 5 (ranging from 2.838 to 3.322), confirming that no multicollinearity problem exists among the independent variables.

Examination of residuals shows that the mean residual is close to zero and its standard deviation aligns with the model's standard error, confirming that the normality assumption of residuals is met (Fig. 4 & Fig.5).

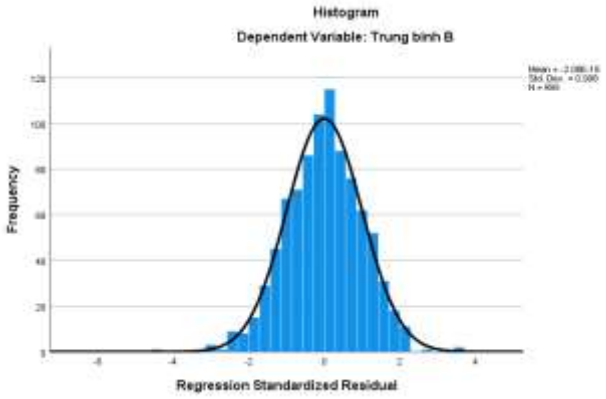


Fig.4. Histogram of regression standardized residual.

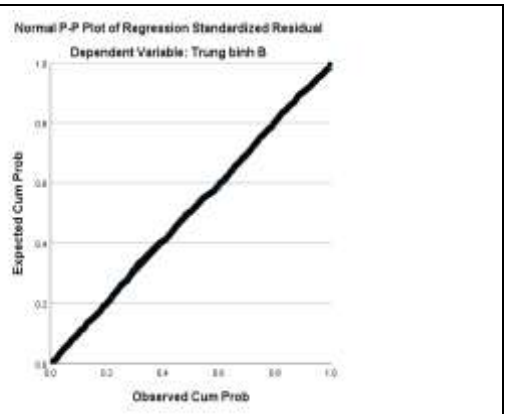


Fig. 5. Normal PP plot of Regression standardized residual.

(Source: Synthesized by authors from research results)

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 indicates that all three components of the COM-B model, Capability, Opportunity, and Motivation, positively influence tourist behavior. Motivation shows the strongest impact ($\beta = 0.413$), suggesting that internal psychological factors play a decisive role in fostering and maintaining sustainable behavior. Capability and Opportunity also have significant positive effects, implying that enhancing knowledge, skills, and supportive environmental conditions can further promote plastic waste reduction behavior.

4. DISCUSSION

4.1. Overview of results and comparison with theory

The results confirm that the COM-B model provides a robust theoretical framework for explaining tourists' behavior in reducing plastic waste. Simultaneously, the specific weighting of its components reveals a significant reliance on individual volition within the context of Viet Nam's coastal destinations. While Motivation, Capability, and Opportunity all demonstrate significant positive influences, the dominance of Motivation ($\beta = 0.413$) suggests that current behavioral changes are primarily driven by intrinsic psychological commitment rather than external systemic support.

This finding offers a deeper perspective on the intent-behavior gap, a topic frequently discussed in environmental psychology. Unlike traditional frameworks such as the Theory of Planned Behavior (TPB) or the Value-Belief-Norm (VBN) model (Ajzen, 1991), (Stern, 2000), which focus mainly on internal drivers as final determinants, the COM-B model (Michie et al., 2011) enables a nuanced understanding of how these drivers interact with situational barriers. The status of Motivation as the strongest predictor indicates a compensatory mechanism: given the inadequate and uncoordinated infrastructure at Viet Nam's coastal sites, tourists must mobilize higher levels of personal commitment to overcome physical obstacles. This implies that pro-environmental actions in this setting remain at a stage requiring substantial effort, where individuals must actively seek solutions rather than being facilitated by their surroundings (Bandura, 1986; Hines et al., 1987; Amin and Ahmed, 2024).

Furthermore, the relatively lower impact of Opportunity ($\beta = 0.240$) identifies a structural bottleneck. Although Opportunity remains a significant prerequisite, its smaller coefficient compared to Motivation and Capability reflects an imbalance between tourist readiness and destination-level support. In many tourism contexts in developed countries, Opportunity often serves as the primary driver due to advanced waste management systems (Allison et al., 2022), (Prawira et al., 2024). However, at the investigated sites, the limited influence of Opportunity suggests that existing infrastructure is not yet sufficient to trigger behavioral change independently, without strong personal motivation.

The significant influence of Capability ($\beta = 0.281$) affirms that environmental literacy and practical knowledge are vital foundations for behavioral change. This finding aligns with social cognitive theories regarding self-efficacy, suggesting that an individual's belief in their own ability is a prerequisite for action (Tabernero and Hernández, 2011). Moreover, the results indicate that for tourists to translate intentions into behavior within a high-constraint environment, they require specific practical knowledge to effectively navigate and respond to the lack of supportive facilities at the destination (Frick et al., 2004), (Hines et al., 1987).

In summary, this study highlights that positive shifts in tourists' plastic waste-reduction behavior in Viet Nam's coastal areas primarily depend on strengthening individual Motivation and Capability, alongside optimizing external environmental support. Therefore, intervention strategies aimed at behavioral improvement must simultaneously enhance tourists' Capability for environmental protection, stimulate intrinsic motivation, and strengthen infrastructure and policy mechanisms to sustain long-term behavioral change.

4.2. Analysis by tourist group

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

International tourists reported a significantly higher mean behavioral score (4.36) than domestic tourists (3.60), indicating superior levels of Capability and Motivation. This suggests that international visitors often possess a more robust environmental knowledge base and internalized social norms, enabling them to maintain plastic reduction practices even when destination infrastructure is limited. These findings are consistent with prior studies indicating that travelers from developed nations tend to exhibit higher participation in pro-environmental behaviors during their trips (Barr et al., 2010), (UNEP, 2018), (Shamsub and Lebel, 2012), (Dolničar and Grün, 2008). Rather than implying behavioral uniformity, these results emphasize the interaction between individual and contextual factors in shaping plastic waste reduction practices.

The disparity between tour-based travelers (3.97) and independent travelers (3.60) is primarily attributed to the Opportunity component. Organized tours often create a more supportive physical and social environment where information, guidance, and plastic-free alternatives are systematically provided and readily accessible. This structure helps narrow the gap between awareness, intention, and actual behavior, a common challenge for independent tourists who lack external support mechanisms. These observations align with previous research suggesting that organized tour settings can promote compliance with environmental practices through clear instructions and concrete action frameworks (Shamsub and Lebel, 2012). However, these interpretations should be viewed with caution as the present study did not explicitly investigate these impact mechanisms.

Furthermore, spending levels highlight the intersection of Motivation and Opportunity. The highest behavioral score (4.02) was observed in the 2–3 million VND spending group, reflecting a synergy between the willingness to pay for sustainable options (Motivation) and better access to service facilities that actively provide eco-friendly infrastructure (Opportunity). This reinforces previous evidence that higher-spending tourists often have more sustainable choices and are more willing to pay a premium for environmentally friendly products and services (Dolničar and Leisch, 2008), (Han et al., 2010).

Conversely, the lack of statistically significant differences across age, education levels, and occupations suggests that plastic reduction behavior at the studied destinations is less influenced by general demographic traits and more dependent on situational factors and specific motivational drivers.

In summary, the results highlight the necessity of segmented behavioral interventions. Plastic reduction strategies should prioritize enhancing Capability and Motivation for domestic tourists while expanding Opportunity through improved infrastructure, information provision, and a supportive social environment, particularly for independent travelers and lower-spending 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: Improving the ability to perform behavior should be considered as a foundation, especially for domestic and independent tourists. Solutions include promoting communication, environmental education, setting up visual guidance tools at destinations (information boards, QR codes, videos, digital applications), and training tour guides, service staff and local communities to become agents to support and monitor green behavior. These measures not only increase knowledge and skills but also make behavior easier to perform and more familiar in the tourism experience.

Improve the effectiveness of behavioral support conditions: The results show that the opportunity factor has a positive impact, reflecting that when tourists are provided with adequate material conditions and favorable policies, plastic reduction behavior will be significantly promoted. Therefore, it is necessary to invest in completing and synchronizing the infrastructure system to support environmental protection behavior, including PW-classified trash bins, public water stations, single-use plastic-free accommodation and restaurants, and clear and transparent waste management regulations. At the same time, it is necessary to develop criteria for "plastic-free destinations" and a mechanism to encourage businesses to meet green standards, thereby creating an ecosystem to support sustainable behavior.

Promote the motivation through encouraging personal values: As the most influential factor, motivation plays a central role in maintaining and spreading sustainable behavior. Destination management policies need to focus on evoking personal values and social responsibility, for example, through communication campaigns that emphasize tourists' roles in protecting the world's natural and cultural heritage. It is necessary to honor positive behavior by giving "Green Tourist" badges, offering reduced service prices when tourists bring their own water bottles, and refusing to use disposable plastic products in hotels. In addition, organizing photo contests and plastic-free check-ins will create effective mental motivation.

Promote the role of travel agencies and tour guides: The behavioral differences between tour-buyers and independent travelers suggest that travel agencies can help coordinate behavior. Therefore, it is necessary to encourage and support travel agencies and tour guides to integrate PW-reduction rules into their tour programs. This could include providing alternative items, guiding waste classification, and motivating tourists throughout the trip.

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.

First, although a relatively large sample size (n = 895) was used to enhance the robustness of the statistical analysis, the reliance on convenience sampling may limit the generalizability of the results to all tourists at coastal destinations in Viet Nam. Future studies could adopt probability-based or stratified sampling approaches to improve representativeness and strengthen external validity.

Second, the study relied primarily on self-reported questionnaire data, which may be subject to social desirability bias, particularly in the context of environmentally responsible behavior. To address this limitation, future research could incorporate qualitative methods, such as in-depth interviews, direct behavioral observations, or field experiments, to more accurately capture tourists' plastic waste-reduction behaviors.

Third, the COM-B model demonstrated a high explanatory power ($R^2 = 0.743$), indicating strong associations between Capability, Opportunity, Motivation, and plastic waste reduction behavior. However, pro-environmental behavior is inherently complex and may be influenced by additional factors, such as social norms, emotions, environmental beliefs, and reference group effects. In addition, as all variables were measured using a single self-reported questionnaire, the potential influence of common method bias and social desirability bias cannot be fully excluded, especially given the study's focus on the environment and its face-to-face data collection methods. Moreover, the use of multiple linear regression does not explicitly account for measurement error or test complex causal pathways among latent constructs. Future studies could therefore extend the analytical framework by integrating COM-B with complementary behavioral theories, including the Theory of Planned Behavior (TPB) (Ajzen, 1991), Norm Activation Model (NAM) (Schwartz, 1977), or the Value-Belief-Norm framework (VBN) (Stern, 2000), and by applying advanced techniques such as structural equation modeling to provide a more comprehensive understanding.

Finally, plastic waste reduction behavior was operationalized as a composite index based on multiple self-reported behaviors that differ in effort level and social context. As a result, the analysis focuses on general behavioral tendencies rather than distinct behavioral dimensions. Future research could use exploratory or confirmatory factor analysis to further examine the underlying structure of tourists' plastic waste reduction behaviors.

5. CONCLUSIONS

In the context of increasingly urgent requirements for sustainable tourism development and marine environmental protection, this study provides important empirical evidence on tourists' PW-reduction behavior at Viet Nam's coastal tourism destinations. Based on a survey of 895 tourists and the application of the COM-B model, the results of multiple linear regression showed that the model explained 74.3% of the variation in PW-reduction behavior ($R^2 = 0.743$), confirming the robust applicability of COM-B in tourism behavior research.

Among the three factors that make up behavior, Motivation has the strongest impact ($\beta = 0.413$), followed by Capability ($\beta = 0.281$) and Opportunity ($\beta = 0.240$), both of which have positive and statistically significant effects ($p < 0.001$). This demonstrates that tourists' PW-reduction behavior not only depends on knowledge and skills but is also strongly influenced by psychological factors and support conditions at the destination.

In addition, the ANOVA results showed significant differences among the tourist groups. International tourists showed more positive behavior than domestic tourists, while tour buyers had higher behavioral scores than independent tourists. In addition, the group with a spending level of 2-3 million VND/day also showed more positive behavior. These results reflect the important role of capability, motivation, access conditions, and financial capability in forming sustainable tourism behavior.

From these findings, the study affirms that the COM-B model is not only meaningful in behavioral theory but also an effective tool to support destination management policy planning. Focusing on the three pillars of Capability - Opportunity - Motivation allows the development of specific behavioral intervention strategies, such as improving tourists' behavioral Capability through education and communication; enhancing the quality of infrastructure and services supporting green behavior; stimulating individual motivation through social recognition and incentive mechanisms; and promoting the intermediary role of travel businesses in guiding sustainable behavior.

However, the study also has limitations, including a convenience sample, reliance on self-reported data, and a focus on a few specific destinations. Therefore, further studies should expand the scope of the survey, incorporate more qualitative and quantitative methods, apply more advanced theoretical models, etc., to provide a more comprehensive and in-depth view of tourists' plastic reduction behavior.

In summary, the study has contributed to clarifying tourists' behavior regarding plastic reduction. The proposed recommendations, based on scientific evidence from the COM-B model, will provide an important basis for policymakers and destination managers to implement effective interventions, aiming to achieve sustainable tourism and marine environment protection in Viet Nam. At the same time, the study also opens up further research directions to expand the subjects and locations, and to diversify methods, thereby developing a more comprehensive behavioral research

model.

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