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*Research article*

## **Potential of establishing a tourism entrance fee for the conservation management of St. Martin’s Island, Bangladesh**

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**Abstract:** St. Martin’s Island was declared an ecologically critical area of Bangladesh in 1999, but this has had limited effect on the conservation of the island’s natural coral resources, on which a thriving tourism industry and the local inhabitants depend. The introduction of a tourism entrance fee can benefit conservation management on the island, but research on the amount that tourists are willing to pay is absent. The objective of this paper is to determine an appropriate entrance fee amount tourists would be willing to pay (WTP) for visiting St. Martin’s Island using contingent valuation method questionnaire surveys and interviews of tourists on the island (n = 327) and the factors that influence their decision. Significance testing and regression analysis were used to assess survey data. A large majority of respondents suggested that they would be willing to pay between 0.78 and 7.8 USD; however, 24.5% said that they would pay nothing and indicated that such reluctance to pay was based on a belief that the responsibility should not fall on themselves as individuals, rather than a lack of

financial capacity. Evidence suggests that even greater tourism entrance fees would still be accepted and amenable to tourists. If a fee of 4.29 USD was introduced, between 350,000 and 3.51 million USD, or 1.93 million USD, could be generated annually. The level of education, income, and a general concern for the environment significantly influenced WTP amounts. This study is aimed at assisting policy decision-makers and conservation managers of St. Martin's Island; required policy actions are briefly discussed.

**Keywords:** Bay of Bengal (BoB); conservation finance; coral and associated resources; ecologically critical areas; willing to pay (WTP)

**JEL Codes:** O22, Z32

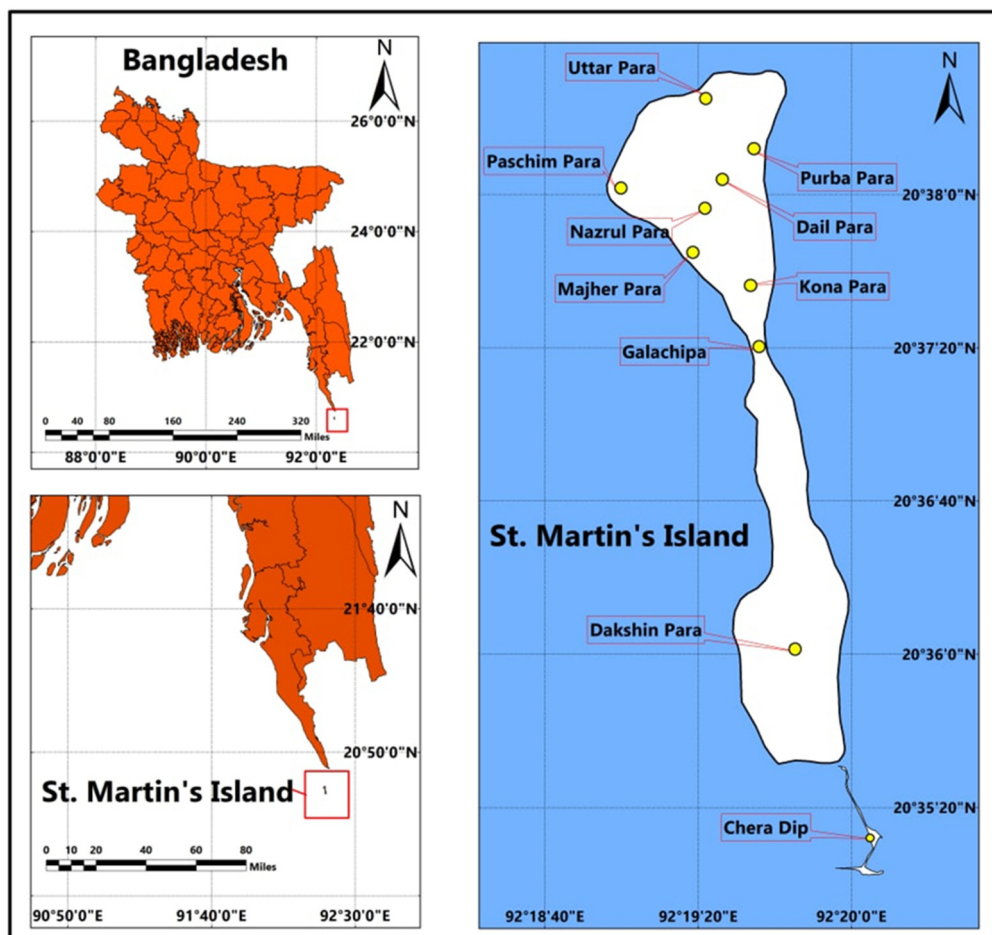
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## 1. Introduction

Saint Martin's Island is the only coral-bearing island in Bangladesh and is a popular tourist destination for both foreign and domestic tourists (Hasan, 2022). However, the lack of tourism regulation increased human pressure and led to the degradation of the island's natural resources (Ashik, 2023; Billah, 2022; Rani et al., 2020). The number of tourists that visit the island during peak season (November–March) reaches 6000 individuals per day (including overnight visitors; Rani, 2020), in addition to the 8000–10,000 inhabitants that reside on the island (Ashik, 2023). The island has limited freshwater resources (Ashik, 2023; Billah, 2022) and lacks the infrastructure to accommodate the masses of tourists, such as appropriate waste disposal, despite the number of lodging facilities available on the island (estimated to be in excess of 50). Moreover, unregulated tourism activities and illegal infrastructure development requiring the removal of mangroves have also been contributing to the degradation of the island's natural resources (Zinat and Roy, 2015), including the coral habitat for which the island is well-known (Burke et al., 2002, 2004, 2011; Cesar et al., 2003; Rajasuriya et al., 2002, 2004; Souter and Lindén, 2000; Wielgus et al., 2003; Zakai and Chadwick-Furman, 2002).

St. Martin's Island is situated on the southern tip of Bangladesh (Figure 1), separated from the east-coast mainland by a 9 km wide channel; it has an 18 km long sandy beach with a gentle slope. The island's rocky subtidal habitat supports 66 coral species (Tomascik, 1997), 89 coral-associated fish species, five globally threatened species of marine mammals, the globally endangered olive ridley turtle, 11 locally threatened reptilian species, and 80 rare bird species (Rani et al., 2020; Sultana et al., 2018), highlighting the need for effective conservation management on the island. St. Martin's Island is the smallest administrative union in Bangladesh, and despite its relatively dense population, the island lacks critical education and healthcare facilities (Ashik, 2023). The livelihood of the inhabitants is threatened by the degradation of the island's coral reefs (Gazi et al., 2020) by negatively impacting fisheries and other resources, limiting livelihood options for the local fishermen. In addition, the island is vulnerable to severe climate change impacts, specifically rainfall, floods, cyclones, and storm surges (Islam et al., 2021). Tourism is the main source of income for the island inhabitants, with 90% of the island populace relying on tourism for their livelihood (Staff Correspondent, *New Age Bangladesh*, 2024), and many families relying on the peak tourism season to sustain them throughout the year

(Billah, 2022). There is a pressing need for effective conservation management to protect the island's natural resources, as they contribute an estimated 33.6 million USD to the local economy per annum (Rani et al., 2020). Management is required not only for conservation but also to ensure the persistence of a thriving tourism industry and maintain the livelihood of island inhabitants.



**Figure 1.** Location of St. Martin's Island with respect to the eastern coast of mainland Bangladesh, in the Bay of Bengal. Image from Uddin et al. (2021).

In 1999, St. Martin's Island was declared an Ecologically Critical Area (ECA) by the Bangladeshi government to protect its biodiversity (Ashik, 2023; Billah, 2022). However, this had a limited effect on the conservation of the island's resources. The national government imposed a travel ban on the island in October 2020, but this was ignored by the majority of the public, and tourism operations continued (Billah, 2022). In January 2021, local tourism operators implemented a strike when the local Department of the Environment, together with the National Coast Guard, moved to enforce the travel ban specifically to inhibit travel to the Chera Dip peninsula of the island (Billah, 2022). The strike was called off after three days at the behest of Teknaf government administration; however, travel bans to Chera Dip have been ineffective since then (Billah, 2022). In 2022, St. Martin's Island and its adjacent ocean area were declared a Marine Protected Area (MPA) by the national government, spanning 1743 km<sup>2</sup> (Ashik, 2023).

In May 2023, the government released a set of planning guidelines and actions for addressing the degradation of St. Martin's Island in an effort to conserve its natural resources (Shams, 2023). These actions include i) the banning of single-use plastics; ii) developing eco-friendly waste-disposal bags for the island; iii) developing a second waste disposal station; iv) implementing the transportation of waste to mainland Bangladesh for recycling; v) development of a volunteer team to keep the island clean; vi) limiting the number of visitors to the island; vii) barring fishermen from using their boats to transport tourists to the island; viii) mandating the online registration of tourists who intend to visit the island; and ix) imposing a fixed travel fee for tourists (Shams, 2023). There is limited published information on fixed travel fees, and it is unconfirmed whether the costs of traveling to the island from the mainland (Teknaf) using local sea ferry services (estimated at 500 BDT; Hasan, 2022) are included and integrated under such a tourism entrance fee.

The introduction of a tourism entrance fee (or travel fee) to St. Martin's Island has the potential to benefit, stimulate, and facilitate conservation management efforts for the island's natural resources—if this tourism fund revenue is allocated appropriately. Many countries have implemented systems to fund the management of biodiverse areas, including MPAs, using tourism fees (Arin and Kramer, 2002; Dharmaratne et al., 2000; Depondt and Green, 2006; Faizan et al., 2016; Han et al., 2011; Schuhmann et al., 2019; Terk and Knowlton, 2010; Uyarra et al., 2010). Several studies have been published related to the fees tourists would be willing to pay as entry fees. Little such research exists for St. Martin's Island as opposed to other Asian areas (Ahmad and Hanley 2009; Asih and Nugraha 2020; Baskara et al., 2017; Chaudhry et al., 2016; Dixit et al., 2010; Faizan et al., 2016; Government of India, 2016; Perera, 2016; Seenprachawong, 2003; Thai National Parks, 2021), hindering the establishment of such a tourist fee mechanism. However, Rani et al. (2020) estimated that tourism associated with St. Martin's island and its coral reefs generated 19.4 million USD annually, whereas 12 million USD was generated annually from fisheries based on the coral reefs. The authors also stated that tourists were willing to pay a mean of 2 USD (equivalent to 2.40 USD when adjusted for inflation) as an entrance fee to St. Martin's Island. The introduction of a tourism entrance fee mechanism thus has the potential to stimulate and contribute to the resilience of the local tourism industry of St. Martin's Island by protecting and conserving the natural ecosystems and species on which the industry relies. Such a mechanism may prove to be invaluable in light of the island's innate vulnerability to climate change effects and other human pressures, which include sea-level rise, coastal erosion, and inundation (as the island is only 3.6 m above sea level). Other vulnerabilities include being situated in a cyclone-prone area, reduced resilience due to the destruction of mangroves for hotel and resort infrastructure, tourism demands for specific fish species, imposing pressure on fish populations, and plastic pollution (Ashik, 2023).

This study is aimed at assisting policy decision-makers and conservation managers of St. Martin's Island in developing effective policies for the conservation of the island's natural resources through increasing financial availability through the proposal of a tourism entrance fee to be used for conservation activities. The objective of this paper is to determine an appropriate entrance fee amount that tourists would be willing to pay (WTP) for visiting St. Martin's Island using questionnaire surveys and interviews, as well as to determine some of the factors that influence their decision. This research hopes to contribute to the development of a tourism fee that does not dissuade tourism on St. Martin's Island but instead encourages it as the proceeds can be directed at conservation efforts to benefit the island's natural environment.

## 2. Methodology

Contingent valuation method (CVM) applications use direct questions to assess respondents' willingness to pay, often involving hypothetical or anticipated changes in environmental conditions (Schuhmann et al., 2019). The CVM is particularly appropriate where the goal is to estimate a respondent's willingness to pay (WTP), such as in single payment mechanisms (entrance fees) associated with an environmental attribute (in this case, for conservation purposes). Other methods, like the choice experiment (CE) method, are more suited to assess multiple attributes or trade-offs between different aspects (such as tourism experience). The CVM is used in this study to determine how much tourists would pay as an entrance fee for natural or protected areas; this method has been used in other studies on similar topics (e.g., Arin & Kramer, 2002; Asih & Nugraha, 2020; Barker, 2003; Dharmaratne et al., 2000; Depondt and Green, 2006; Faizan et al., 2016; Han et al., 2011; Schuhmann et al., 2019; Uyarra et al., 2010). Respondents participating in a CVM survey may be invited to express their support or opposition to a specific project or proposed change through a "yes" or "no" vote (Schuman et al., 2019). When the proposed change involves a cost to the respondent, this method of preference elicitation can be linked to an economic valuation (Schuhmann et al. 2019). To facilitate this process, a "payment vehicle" is typically outlined, which clarifies how the payments will be collected, such as through increased taxes, a user fee, or a voluntary contribution to a trust fund. The data gathered from willingness-to-pay (WTP) questions can be analyzed using various statistical techniques ranging from basic descriptive statistics to more complex regression models. By also collecting data on respondent attitudes and demographic characteristics, researchers can assign economic value based on individual traits or aggregate value across groups (Schuhmann et al., 2019).

In this study, a survey questionnaire was used to determine the amount respondents were willing to pay (WTP) as a tourism entrance fee (supplementary materials). When using survey questionnaires, the answers from respondents may contain inherent biases related to the hypothetical nature of stated preference techniques, where strategic behavior may skew results (such as replying appropriately to maintain their access to resource extraction). However, most biases can be eliminated, or their impacts significantly limited, through specific framing and careful construction of questions presented to respondents; also, strategic behavior tends to be infrequent (Blackwell & Asafu-Adjaye, 2020; Cummings et al., 1986; Mitchell & Carson, 1989; Tisdell et al., 2008). Payment cards, bidding games, open-ended questions, and referendum/dichotomous choice methods are widely used indicators to measure a person's WTP value. To avoid the tendency of respondents to "anchor" to a suggested WTP amount presented within the question, such as with a single bounded dichotomous choice approach, an open-ended approach was used (with no reference to a specific WTP amount within the question) to offer a broad distribution of WTP responses. However, when respondents are given open-ended questions, they may tend to overstate the WTP value (Mathieu et al., 2003). While dichotomous choice that fulfills "incentive compatibility" (Carson & Groves, 2007) may be the gold standard in CVM studies, given that this study is the first of its kind for St. Martin's Island (with no other information on which to form or center dichotomous choice questions around), the survey questionnaire was designed with open-ended questions in mind to sample a full range of WTP values the public would be amenable to and not have this range be influenced by predetermined categories or fixed points (such as "higher" or "lower" than a specific value). The method in the current paper aligns with the methods for numerous other studies where dichotomous choice adhering to the concepts of "incentive compatibility" was not used in determining WTP values (reviewed in Blackwell & Asafu-Adjaye, 2020).

In addition, many zero responses, either true zero values or answers in protest, may be found when an open-ended format is used. To distinguish between answers given in protest to the establishment of a potential tourism entrance fee and true zero responses, an open-ended follow-up question was used to determine the reason for the respondent's previous answer (see supplementary materials). This helped to identify whether the respondents were in fact opposed to the establishment of a tourism entrance fee as a conservation management strategy for a proposed marine park on St. Martin's Island (protest zero bids) or rather thought that the cost of establishing such a mechanism should not fall on themselves as individuals but rather on an external organization such as the local government (true zero bids).

Respondents were told that the local government was planning to build a marine park on the Island and user fees to enter the island may be charged for the conservation and management of the island's resources and ecosystem. Additional questions were also posed to each respondent to assess how regularly they visited St. Martin's Island, their attitude toward the proposal of a tourism entrance fee for conservation management, the maximum amount they would be willing to pay for such a fee, and their general concern for environmental preservation and protection. The questionnaire also assessed various demographic and socioeconomic factors of each respondent (age, income, education level, profession, nationality, and gender).

The questionnaire was developed in Bengali (local language) to ensure that respondents would be able to understand, and also assisted with communication through local enumerators. An English version of the questionnaire was also developed for foreign respondents. Four science graduates were selected as enumerators and familiarized themselves with the questionnaire. The graduates were given a 3-day training workshop on how to collect information accurately from respondents without bias. A total of 327 domestic and foreign tourists who made an overnight stay in one of the resorts of St. Martin's Island were interviewed using the contingent valuation questionnaire; this is a similar number of respondents as in previous studies (Barker et al., 2003; Uyarra et al., 2010). A random sampling technique was used when approaching visitors, and most visitors agreed to participate when approached. The survey was conducted over a period of about two months, starting on October 20, 2017, and ending on December 19, 2017. Respondents' information was cross-referenced with that from ferry boats and other local boat owners who transport tourists from the mainland (Teknaf) to St. Martin's Island.

All WTP responses as well as demographic and socioeconomic data were later collapsed into predetermined fixed WTP amounts. Descriptive statistics were computed, and significance testing and regression analysis were used to analyze the data from the questionnaires. Regression analysis is a common statistical method used to explain a single variable by a set of explanatory variables, as well as generalized linear modeling (GLM). The Poisson distribution is normally used for modeling count data; in this study, the assumptions of the Poisson distribution (homoscedasticity and equal means) were not met and, consequently, negative binomial regression was used to assess the response variable under consideration. Non-parametric significance testing (Wilcoxon rank sum and Kruskal–Wallis) was used to compare means ( $\alpha = 0.05$ ), as sample sizes of different demographic and socioeconomic groups were small. For exploratory purposes, this study utilized a graphical approach to obtain insights into the amount respondents were WTP for entry to St. Martin's Island. WTP was compared among various socioeconomic variables, which were tested for significance using regression analysis. To describe the WTP value, a generalized linear model, specifically a negative binomial model, was used to keep the assumption as valid as possible. Maximum likelihood estimation (MLE) was used, requiring the model output to be maximized with respect to the parameters. The value of the regression coefficients in the

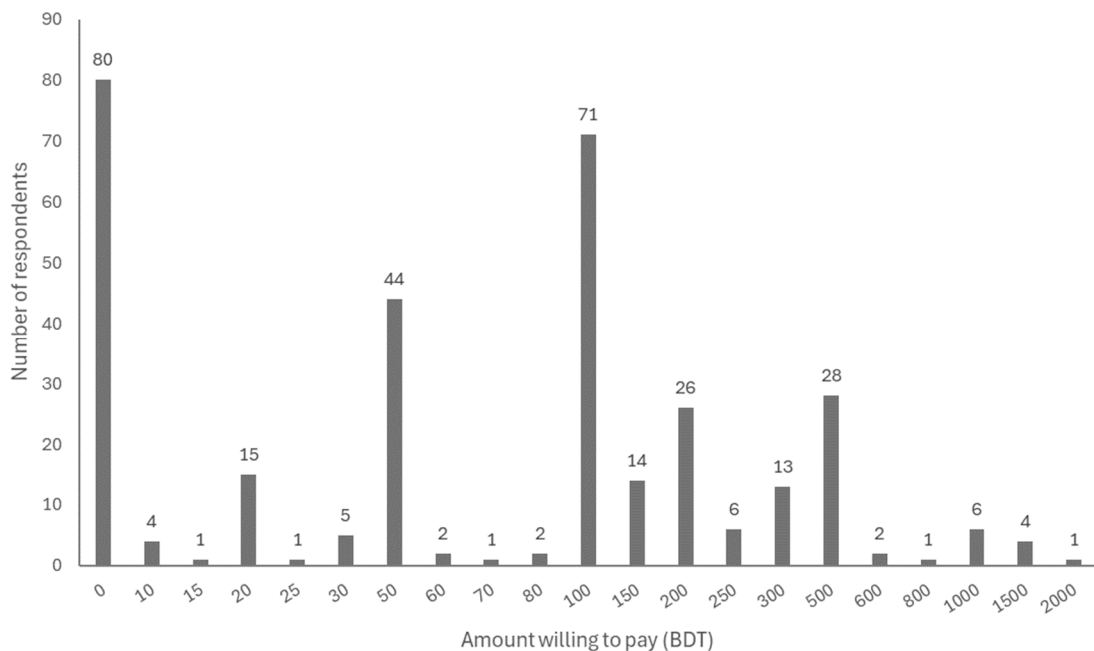
model was then tested using the Wald statistic against the null hypothesis for inferring any potential significant impact of a variable (parameter) on WTP.

To facilitate comparability with results of other similar studies, mean WTP (BDT) was converted to USD using spot exchange rates for 2017 (Arrow et al., 1993) and was thereafter adjusted for inflation up to April 2024<sup>1</sup>. WTP amounts from other research (USD at the time the respective studies were published) were also adjusted for inflation in the same manner using CPI Inflation Calculator (2024)<sup>2</sup>.

### 3. Results

From cross-referencing with the local boat operators, it was revealed that an average of 5000 tourists visit St. Martin's Island every day during peak season (November–March), with an estimated 450,000 tourists visiting each year.

WTP data obtained from the survey of 327 respondents (n) was summarized using various graphical and statistical summary measures. The mean WTP was 161.71 BDT, with a standard deviation of 263.09 BDT. The median WTP was 100 BDT, and the modal WTP was 0 BDT.



**Figure 2.** Frequency distribution of the amount respondents were willing to pay (BDT) as an entrance fee for St. Martin's Island.

<sup>1</sup> Exchange rates (2024) US Dollar to Bangladesh Taka Spot Exchange Rates for 2017. Exchange rates.org.uk - The UK's favourite currency site. Online Web application. Accessed on 6 April 2024. Available from: <https://www.exchangerates.org.uk/USD-BDT-spot-exchange-rates-history-2017.html#>

<sup>2</sup> CPI Inflation calculator (2024) Online Web application. Accessed on 6 April 2024. Available from: <https://www.in2013dollars.com/us/inflation/2017?amount=6.16>

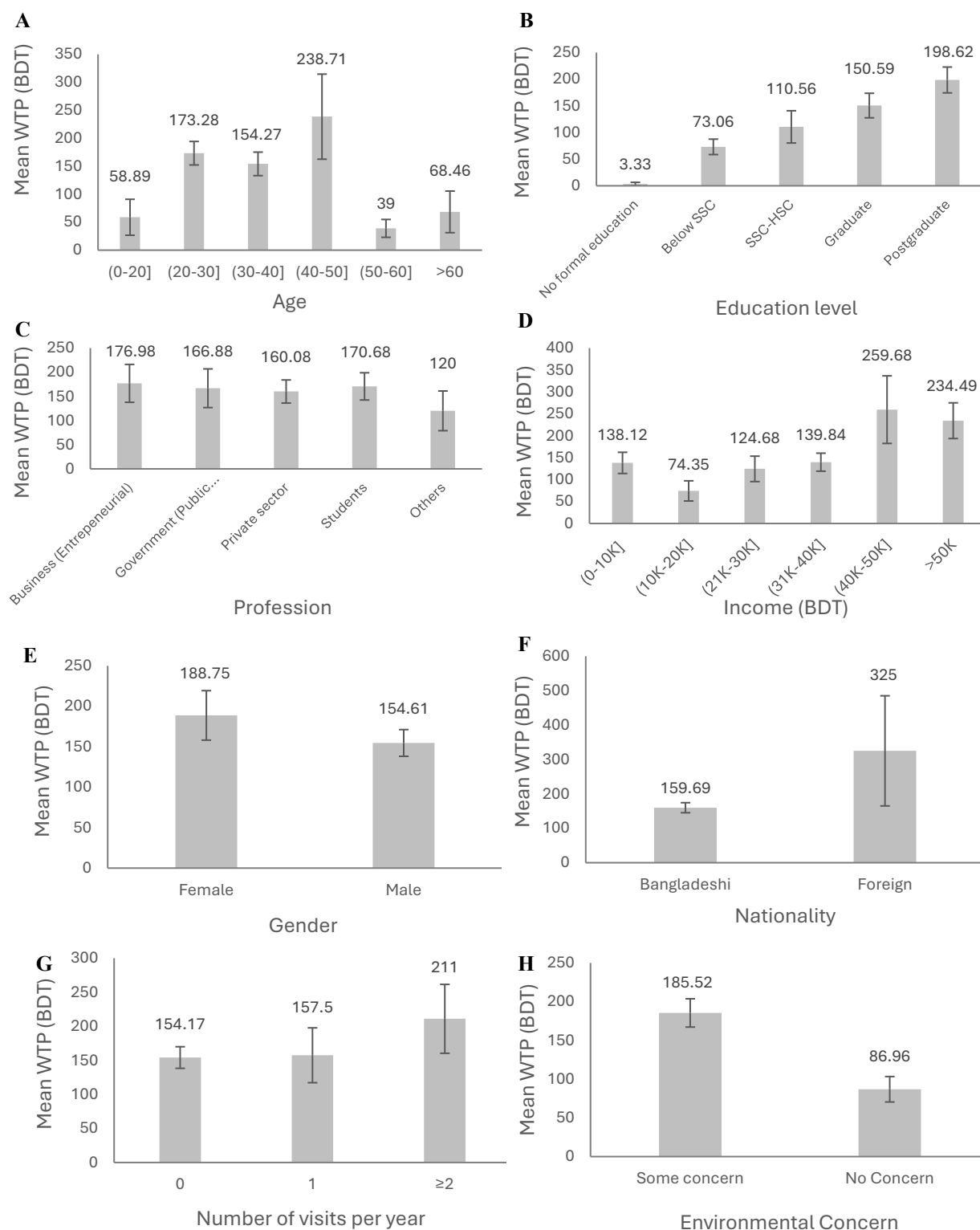
The frequency distribution of WTP values (Figure 2, Table 1) indicates that 24.5% of respondents were unwilling to pay any amount (80 from a total of 327). However, follow-up questions indicated that the majority (more than 98%) of respondents who gave zero-value answers were not opposed to the establishment of a tourism entrance fee for the conservation management of a marine park; instead, they believed that such cost should be supported by someone else (the government, local fishermen, or hotel/resort owners). The second greatest fraction of respondents (21.7%, 71 from a total of 327, Figure 2, Table 1) indicated that they would be WTP 100 BDT as an entrance fee to St. Martin's Island, followed by 50 BDT (13.5%, 44 from a total of 327, Figure 2). Data also shows that a large proportion of respondents were willing to pay between 100 and 500 BDT, with some respondents WTP amounts greater than 1000 BDT and even 2000 BDT (Figure 2).

**Table 1.** Frequency distribution of willing to pay (WTP) amount measured in Bangladeshi Taka (BDT).

WTP (BDT)	Frequency	Fraction of total (%)
0	80	24.46
10	4	1.22
15	1	0.31
20	15	4.59
25	1	0.31
30	5	1.53
50	44	13.46
60	2	0.61
70	1	0.31
80	2	0.61
100	71	21.71
150	14	4.28
200	26	7.95
250	6	1.83
300	13	3.98
500	28	8.56
600	2	0.61
800	1	0.31
1000	6	1.83
1500	4	1.22
2000	1	0.31
<b>Total (n)</b>	<b>327</b>	

The mean amount that respondents were willing to pay according to various demographic and economic factors was also assessed (Figure 3, Table 2). Results indicate that respondents aged between 20 and 50 years would be willing to pay between 154.27 ( $\pm 20.95$ ) and 238.71 BDT ( $\pm 75.93$ ) as an entrance fee (Figure 3A, Table 2). However, this amount decreased for age groups younger than 20 years and greater than 50 years (Figure 3A). Significant differences in the amount respondents were WTP appeared to be associated with age ( $p < 0.05$ , Wilcoxon rank sum test, Table 3).





**Figure 3.** Summary of amounts that respondents of different demographic and socioeconomic groups were willing to pay (BDT) as a tourism entrance fee to St. Martin's Island. A: age, B: education level, C: profession, D: income (BDT), E: gender, F: nationality, G: number of visits to St. Martin's Island per year; and H: presence of environmental concern. Data labels reflect mean WPT.

**Table 2.** Summary of amounts that respondents of different demographic and socioeconomic groups were willing to pay (BDT) as a tourism entrance fee to St. Martin's Island.

Variable	Categories within variable	n	Mean WTP (BDT)	Standard deviation	Standard error	Min. WTP	Max. WTP
Gender	Female	68	188.75	251.86	30.54	0	1500
	Male	259	154.61	265.98	16.53	0	2000
Nationality	Bangladeshi	323	159.69	262.28	14.59	0	2000
	Foreign	4	325	320.16	160.08	100	800
Age	(0–20]	9	58.89	96.62	32.21	0	300
	(20–30]	137	173.28	245.73	20.99	0	1500
	(30–40]	123	154.27	232.35	20.95	0	1500
	(40–50]	35	238.71	449.23	75.93	0	2000
	(50–60]	10	39	50.43	15.95	0	150
	>60	13	68.46	134.22	37.23	0	500
Education level	No formal education	3	3.33	5.77	3.33	0	10
	Below SSC	18	73.06	61.72	14.55	0	200
	SSC-HSC	54	110.56	222.35	30.26	0	1500
	Graduate	93	150.59	222.37	23.06	0	1500
	Postgraduate	159	198.62	305.48	24.23	0	2000
Profession	Business (Entrepreneurial)	63	176.98	310.63	39.14	0	1500
	Government (Public sector)	32	166.88	226.59	40.06	0	1000
	Private sector	121	160.08	263.7	23.97	0	2000
	Students	73	170.68	240.97	28.20	0	1500
	Others	38	120	253.52	41.13	0	1500
Income	(0–10K]	72	138.12	204.92	24.15	0	1500
	(10K–20K]	31	74.35	128.33	23.05	0	500
	(21K–30K]	62	124.68	228.62	29.03	0	1500
	(31K–40K]	62	139.84	162.01	20.58	0	600
	(40K–50K]	31	259.68	428.65	76.99	0	2000
	>50K	69	234.49	337.24	40.60	0	1500
Visits per year	0	229	154.17	239.82	15.85	0	1500
	1	58	157.5	306.42	40.23	0	2000
	≥2	40	211	319.81	50.57	0	1500
Environmental concern	Some concern	248	185.52	286.78	18.21	0	2000
	No concern	79	86.96	146.26	16.46	0	1000

An increasing level of education trended positively with increasing WTP amounts (Figure 3B); respondents with no formal education ( $n = 3$ ) were willing to pay a mean of 3.33 BDT ( $\pm 3.33$ ), and postgraduate respondents ( $n = 159$ ) were willing to pay a mean of 198.62 BDT ( $\pm 24.23$ ) (Table 2). Notwithstanding the positive association between the two factors, significant differences in WPT appeared to be associated with differences in education level ( $p = 0.05$ ,  $df = 4$ , Kruskal–Wallis test, Table 3).

The profession of respondents did not appear to be associated with significant differences in WTP amounts ( $p > 0.05$ ,  $df = 4$ , Kruskal–Wallis test, Table 3) but the data indicates that respondents of all specified professions would pay a minimum mean WTP of 120.00 BDT ( $\pm 41.13$ ) (Figure 3C, Table 2). On the other hand, the income level of respondents was associated with significant differences in WTP amounts ( $p < 0.05$ ,  $df = 5$ , Kruskal–Wallis test, Table 3). Lower-income groups were willing to pay between 74.35 ( $\pm 23.05$ ) and 139.84 BDT ( $\pm 20.58$ ), whereas higher-income groups were willing to pay greater amounts, namely between 234.49 ( $\pm 40.60$ ) and 259.68 BDT ( $\pm 76.99$ ) (Figure 3D, Table 2).

**Table 3.** Results of non-parametric significance testing for different potential explanatory variables of WTP.

Variable	Test	Statistic value	df	p-value
Gender	Wilcoxon	10756.5	-	0.00
Nationality	Wilcoxon	288.00	-	0.05
Environmental concern	Wilcoxon	7550.5	-	0.00
Age	Kruskal–Wallis	13.17	5	0.02
Education	Kruskal–Wallis	9.28	4	0.05
Profession	Kruskal–Wallis	3.35	4	0.50
Income	Kruskal–Wallis	15.61	5	0.01
Visits per year	Kruskal–Wallis	326.00	2	0.00

Differences in the gender of respondents appeared to be associated with significant differences in WTP ( $p < 0.05$ , Wilcoxon rank sum test, Table 3), with female respondents ( $n = 68$ ) being willing to pay a larger mean amount ( $188.75 \pm 30.54$  BDT) than male respondents ( $154.61 \pm 16.53$  BDT,  $n = 259$ ) (Figure 3E, Table 2). Respondents' nationality was also associated with significant differences in WTP amounts; foreign respondents were willing to pay a greater amount ( $325 \pm 160.08$  BDT) than Bangladeshi nationals ( $159.69 \pm 14.59$  BDT) (Figure 3F, Table 2). However, only four foreign tourists were interviewed, compared to 323 Bangladeshi tourists (Table 2).

Differences in the typical number of visits to St. Martin's Island were associated with significant differences in the amount that respondents were willing to pay ( $p < 0.05$ ,  $df = 2$ , Kruskal–Wallis test, Table 3). Respondents who visited the island more frequently were willing to pay greater amounts (Figure 3G, Table 2). Similarly, differences in whether respondents had a degree of environmental concern were also associated with significant differences in the amount they were willing to pay ( $p < 0.05$ , Wilcoxon rank sum test, Table 3). Data indicate that respondents having some degree of concern for the environment were willing to pay more ( $185.52 \pm 18.21$  BDT,  $n = 248$ ) than those who were not concerned ( $86.96 \pm 16.46$  BDT,  $n = 79$ ) (Figure 3H, Table 2).

The results of the regression analysis reflect the influence that different subdivisions of demographic and economic variables have on WTP amounts (Table 4). The regression p-value determines whether the regression coefficient (maximized value of independent variables in the GLM, in this case, the sociodemographic variables) has a significant impact on the dependent variable (WTP). The results of the regression analysis suggest that none of the subdivisions of age, gender, profession, or number of visits were associated with significant differences in WTP ( $p > 0.05$ , Table 4). This contradicts the results of the non-parametric significance testing, which indicated a significant effect of the number of visits per year, age, and gender (Table 3).

Regression results also suggest that income, level of education, and any degree of general environmental concern may be associated with significant differences in WTP amounts for St. Martin's Island (Table 4). Regression results suggest that income brackets greater than 40,000 BDT may be associated with significant differences in WTP amounts ( $p < 0.05$ , Table 4), whereas income brackets below 40,000 BDT may not ( $p > 0.05$ , Table 4). An education level above secondary school certification (SSC) (equivalent to 10th grade) was associated with significant differences in WTP amounts ( $p < 0.05$ , Table 4), whereas education levels below SSC were not ( $p > 0.05$ , Table 4). In addition, any level of general concern for environmental protection and conservation was associated with significant differences in WTP amounts ( $p < 0.05$ , Table 4).

**Table 4.** Summary of the results from negative binomial regression analysis conducted on different potential explanatory variables for WTP.

Variable		Estimate of coefficient ( $\beta$ )	Standard error	Wald statistic (Z)	p-value
Gender	(Intercept)	1.55	1.33	1.16	0.245
	Female ( <i>ref</i> )				
	Male	-0.39	0.29	-1.34	0.181
Age	(0–20] ( <i>ref</i> )				
	(20–30]	0.92	0.67	1.37	0.171
	(30–40]	0.62	0.69	0.89	0.373
	(40–50]	0.96	0.75	1.29	0.197
	(50–60]	-0.33	0.94	-0.35	0.716
	>60	0.33	0.91	0.36	0.716
Education level	No formal education ( <i>ref</i> )				
	Below SSC	2.06	1.23	1.68	0.092
	SSC-HSC	2.45	1.18	2.08	0.037
	Graduate	2.45	1.19	2.06	0.039
	Postgraduate	2.69	1.19	2.26	0.024
Profession	Students ( <i>ref</i> )				
	Business (Entrepreneurial)	-0.66	0.44	-1.51	0.130
	Government (Public sector)	-0.98	0.51	-1.91	0.056
	Private sector	-0.75	0.43	-1.74	0.081
	Others	-0.01	0.46	-0.03	0.977
Income	(0–10K] ( <i>ref</i> )				
	(10K–20K]	-0.38	0.43	-0.90	0.370
	(21K–30K]	0.30	0.42	0.70	0.484
	(31K–40K]	0.70	0.44	1.59	0.113
	(40K–50K]	1.13	0.51	2.21	0.027
	>50K	1.08	0.45	2.40	0.016
Visits per year	0 ( <i>ref</i> )				
	1	0.07	0.27	0.25	0.805
	$\geq 2$	0.16	0.32	0.51	0.612
Environmental concern	No concern ( <i>ref</i> )				
	Some concern	0.51	0.26	1.97	0.049

#### 4. Discussion

This study involved interviewing and questioning tourists of St. Martin's Island, specifically enquiring about the amount tourists would be willing to pay as an entrance fee, knowing that the proceeds would be directed toward the conservation management of the island. The frequency distribution data (Figure 1, Table 1) suggests that the majority of tourists were willing to pay between 50 and 500 BDT in 2017 (not including zero bids, Figure 1, Table 1). A tourist entrance fee could thus be established in the equivalent recommended range of 0.78–7.8 USD (2024) for the conservation management of St. Martin's Island. If the central limit theorem were to be used to guide the determination of a tourist entrance fee within the recommended range of 0.78–7.8 USD, then the price of the fee would amount to a mean of 4.29 USD. Policymakers may even consider adopting the price of 100 BDT or 1.56 USD, which was associated with the largest fraction of respondents that were amenable to paying an entrance fee (Figure 2). Policymakers are at liberty to assess the frequency distribution data themselves for informing the pricing of a potential entrance fee to St. Martin's Island. The majority of respondents interviewed were domestic tourists ( $n = 323$  of a total of 327), and a tourist entrance fee set in this range has the greatest likelihood of being acceptable and affordable to local tourists. However, a large proportion of respondents (24.5%) indicated that they were not willing to pay any amount as a conservation entrance fee (Figure 1, Table 1), as they felt that such cost should fall under the government's responsibility and not the individual. There is no consensus among published literature regarding which type of zero bids are true protest bids (Frey & Pirscher, 2019), with differences in different study areas recommending different approaches (such as in a review of CVM in the health industry recommending that zero valuations motivated by inability to pay or due to the fact the good is of no value to the respondent should be classified as true zero valuations; Rankin & Robinson, 2018).

Previous research on St. Martin's Island indicated that tourists were willing to pay a mean of 2 USD (Rani et al., 2020), which is equivalent to 2.40 USD when adjusted for inflation. Arin and Kramer (2002) conducted a study in Anilao, Philippines, which showed that divers and snorkelers are ready to pay 3.70 USD to visit a site (equivalent to 6.38 USD in 2024). Mathieu et al. (2003) indicated that in other islands in the Indian Ocean, specifically Seychelles, divers and snorkelers would be willing to pay as much as 12.20 USD (equivalent to 20.58 in 2024). In Peru, to enter the Tambopata National Reserve, Roberts et al. (2017) found that 66% of the respondents would be willing to pay 10.00 USD (equivalent to 12.66 USD in 2024). The range of WTP amounts as recommended from the data in this study agrees with the findings of other WTP research from the neighboring Bay of Bengal (BoB) rim countries (summarized in Table 5). However, the WTP amount inferred using the central limit theorem (4.29 USD) is somewhat greater than that found in other research for domestic tourists (0.2–3.65 USD in 2024, Table 5).

**Table 5.** Summary of coral reef status and entrance fees for tourists in Bay of Bengal (BoB) rim countries. Entrance fees have also been adjusted for inflation (up to April 2024) from the date they were published. a: foreign tourist; b: domestic tourist.

BoB rim countries	Name of coral reef	Status	Area (km <sup>2</sup> )	Number of tourist visits (per year)	Purpose of visit (activity)	Entrance fee (USD, as published)	Inflation-adjusted entrance fee (USD in April 2024)	Source
India	Gulf of Mannar	Fair	94.3	NA	Glass bottom boating, swimming, snorkeling, scuba diving	0.14	0.2	Dixit et al., 2010
	Andaman Islands and Nicobar Islands	Good	959.2	487 229	Snorkeling, scuba diving	1.37 <sup>a</sup> 0.69 <sup>b</sup>	1.95 <sup>a</sup> 0.98 <sup>b</sup>	Chaudhry et al., 2016; Dixit et al., 2010
	Lakshadweep	Moderately poor	816.1	7427	Scuba diving, snorkeling, windsurfing, kayaking, canoeing, fishing	0.69	0.98	Dixit et al., 2010; Government of India, 2016
Thailand	Phi Phi Island	Moderately poor	388	156 817	Snorkeling, boating and diving, swimming, beach activities	12.76 <sup>a</sup> 1 <sup>b</sup>	21.52 <sup>a</sup> 1.69 <sup>b</sup>	Seenprachawong, 2003
	Mu Ko Similan Marine National Park	Good	140	598 500	Scuba diving, snorkeling	15.95 <sup>a</sup> 3.19 <sup>b</sup>	18.27 <sup>a</sup> 3.65 <sup>b</sup>	Thai National Parks, 2021
Malaysia	Payar Marine Park	Moderately poor		133 775	Scuba diving, snorkeling	61.54	89.02	Ahmad and Hanley, 2009
	Redang Marine Park	Slightly poor	25	63,826		7.28 <sup>a</sup> 1 <sup>b</sup>	10.53 <sup>a</sup> 1.45 <sup>b</sup>	
	Tioman Marine Park	Good	468	213 172				
	Cape Rachado, FPAS	Very poor	1	345 000	Scuba diving	No fees		Faizan et al., 2016

*Continued on next page*

BoB rim countries	Name of coral reef	Status	Area (km <sup>2</sup> )	Number of tourist visits (per year)	Purpose of visit (activity)	Entrance fee (USD, as published)	Inflation-adjusted entrance fee (USD in April 2024)	Source
Indonesia	Gili Labak Island, Madura	Good	0.05	31,000	Snorkeling	0.35	0.42	Asih and Nugraha, 2020
	Karimunjawa Marine National Park	Slightly poor	1116	118 301	Fishing, snorkeling, swimming	1.74 <sup>a</sup> 0.35 <sup>b</sup>	2.20 <sup>a</sup> 0.44 <sup>b</sup>	Baskara et al., 2017
Bangladesh	St. Martin's Island	Very poor	12	1.46–2.19 million	Surfing, boating, snorkeling	No fees		Rani et al., 2020
Sri Lanka	Pigeon Island National Park	Moderately poor	4.71	43,912	Scuba diving, swimming, snorkeling, glass bottom boating	10 <sup>a</sup> 0.2 <sup>b</sup>	12.93 <sup>a</sup> 0.26 <sup>b</sup>	Perera, 2016

A variety of demographic and economic factors were also assessed to determine whether respective differences were associated with differences in WTP amounts. These included age, education, profession or type of occupation, income level, gender, nationality, number of visits to St. Martin's Island per year, and whether respondents had some degree of general environmental concern with respect to conservation. The results of statistical analyses (both non-parametric significance testing and regression analyses) suggested that differences in income, education level, and degree of environmental concern were associated with significant differences in determining WTP amounts (Tables 3 and 4). WTP amounts trended positively with increasing levels of each of these factors, albeit to different degrees (Figure 3B, D, H), indicating that respondents were willing to pay greater tourist fees if they had higher levels of income, higher levels of education (particularly greater than SSC or grade-10 schooling), and some level of concern for environmental conservation and protection. These variables are known to co-vary (Clery and Rhead, 2014; Franzen and Meyer, 2010; Khan and Giurca Vasilescu, 2008; Strieder Philippssen et al., 2017). The results of the regression analyses and significance testing contradict one another where age, gender, and the number of visits to St. Martin's Island are concerned in their relation to differences in WTP amounts (Tables 3 and 4). This may be due to the use of non-parametric significance testing, which is generally considered to be less capable than other equivalent parametric tests of detecting a significant difference between means (Frost, 2017).

These findings agree with the mixed results of previous research. Han et al. (2011) found that relatively older tourists would be willing to pay greater tourist entrance fees than younger persons; however, younger visitors who dove would be willing to pay higher fee amounts (Asafu-Adjaye and Tapsuwan, 2008; Shams, 2023, Terk and Knowlton, 2010). Dharmaratne et al. (2000) found that repeat visitors opted for lower WTP bids than first-time visitors to a marine reserve in Jamaica, whereas Baral et al. (2008) concluded that visitors who tended to stay longer in a marine reserve were willing to pay greater fees. Other studies also confirm that respondents who were concerned with environmental health and the preservation of coral reefs tended to opt for higher WPT amounts (Tapsuwan, 2005;

Togridou et al., 2006). Peters and Hawkins (2009), from a meta-analysis of 18 studies, found that tourists' education, income, residency, and environmental awareness influence WTP values in that they are directly proportional, similar to our own findings on the tourists of St. Martin's Island.

The introduction of a tourism entrance fee is a commonly used mechanism in Southeast Asian countries to facilitate the management of MPAs and the conservation management of valuable natural areas (Table 5; Depondt and Green, 2006 in the Caribbean). An estimated 450,000 tourists visit St. Martin's Island annually, indicating a potential annual revenue of 350,000–3.51 million USD if a tourism entrance fee was introduced using the recommended range from the data in this study. A potential total annual revenue of 1.93 million USD could be generated if an entrance fee of 4.29 USD was introduced (using the central limit theory). Furthermore, the maximum WTP amount of 2000 BDT in 2017 (31.18 USD in 2024) was associated with domestic respondents and not foreign tourists (Table 2), indicating that there is potential to increase the tourist entrance fee amount beyond the recommended range that the data suggests. However, this may be implausible, considering that approximately 25% of the respondents indicated that they were not willing to pay anything because they felt the cost of conservation management should fall on an external organization. Considering those 25% of the total number of tourists that would not be willing to pay, the potential total revenue that could be generated would instead be estimated at 260,000–2.63 million USD. Alternatively, if the price of 1.56 USD were adopted, a total annual revenue of approximately 526,000 USD could be generated. Greater tourism entrance fees may contribute to limiting the number of tourists that visit St. Martin's Island according to the plans by the local government (Shams, 2023); however, previous research suggests that higher user fees alone may have little impact on the number of visitors (Thur, 2010).

Research shows that certain groups of tourists like divers and snorkelers would be willing to pay greater entrance fee amounts specifically for the protection and conservation of coral reefs as well as for the guarantee or increased likelihood of viewing desired marine species (Murphy et al., 2018; and Rudd and Tupper, 2002, in the Caribbean; Grafeld et al., 2016 in Guam; Cerrano et al., 2017 in the Mediterranean). Conservation management efforts could, in turn, result in even greater WTP values for tourism fees, as in many cases they depend on the health and condition of live corals, water quality, and the variety of recreation activities available (Wielgus et al., 2010). In Belize, an average 3.75 USD conservation fee was charged to all tourists (1996–2017), but when the fee was later raised to an average of 20.00 USD, approximately 80% of tourists were still willing to pay (Casey and Schuhmann, 2019). Similar findings regarding WTP have been found elsewhere by Murphy et al. (2018), Thur (2010), and Roberts et al. (2017) in Fiji, Bonaire, Taiwan, Peru, and Mexico.

Imposing a tourism entrance fee to generate additional revenue and lessen the burden of cost on the local government can facilitate the conservation and protection of St. Martin's Island's natural ecosystems, on which the local tourism industry and livelihood of inhabitants rely. However, certain policy actions are required to ensure the mechanism is effective in practice. Critically, ensuring that the majority of the proceeds are allocated in a transparent manner to the protection and restoration of critical natural ecosystems, like the coral reefs, and the development of necessary island infrastructure and services, such as waste management and freshwater provisioning, is required for widespread acceptance and integration among local residents (Peters and Hawkins, 2009; Casey et al., 2010). With a limitation on the number of tourists that visit the island annually, the livelihood of locals that rely on tourism will thus be negatively affected; ensuring that local communities and inhabitants of the island share the economic benefits of a fixed tourism fee can help to offset this. Other avenues to which the revenue could be directed include *designed eco-tourism* where the most suitable areas on the island



are earmarked for specific tourism activities and their requirements (Habib et al., 2024). Long-term monitoring of the health of corals and other natural resources on St. Martin's Island is also recommended to track and assess conservation and restoration efforts. The revenue of the tourism entrance fee could also be directed toward additional efforts in education and enforcement on the island.

This study is limited in that it uses data from 2017, which may not reflect the current opinions and views of tourists that visit St. Martin's Island; however, as no fixed tourism entrance fee exists yet, data are still relevant and topical. The study is further limited by the relatively small sample size of tourists assessed, compared to the total number of tourists per day (5000 during the peak season in 2017, 5000–8000 tourists during the peak season in 2023; Shams, 2023). It is thus recommended that the study be repeated with a larger sample size and that data be generated that more accurately reflects the present public opinion. In addition, it is recommended that future CVM studies of this nature be conducted around dichotomous choice CVM questionnaires that adhere to incentive compatibility (Carson & Groves, 2007). Future research could be directed to include the development of other mechanisms that capitalize on the natural resources of St. Martin's Island to generate additional revenue and benefit local residents (such as mangrove conservation and operationalizing blue carbon), as well as to develop other sustainable financing mechanisms to incentivize the conservation and preservation of natural resources. This could be particularly relevant to other islands with limited conservation management, similar to previous research that has been conducted assessing the feasibility of financial possibilities to support regional marine protected areas in Martinique, Caribbean (Failler et al., 2019).

## 5. Conclusions

This study involved interviewing and questioning tourists of St. Martin's Island, specifically enquiring about the amount tourists would be willing to pay as an entrance fee, knowing that the proceeds would be directed toward the conservation management of the island. Tourists were willing to pay a fixed tourism entrance fee amount between 50 and 500 BDT, equivalent to an estimated inflation-adjusted value between 0.78 and 7.8 USD in 2024. A proposed fixed tourism entrance price was 4.29 USD. There is evidence and potential to impose even higher tourism entrance fee amounts that would still be accepted and amenable to tourists. Factors influencing the amount that tourists were willing to pay included education level, income, and whether or not tourists had some level of general concern for the protection and conservation of the environment. The total potential annual revenue that could be generated was 350,000–3.51 million USD or 1.93 million USD if a fee of 4.29 USD was introduced. The development of a tourism entrance fee to generate additional revenue and lessen the burden of cost on the local government can facilitate the conservation and protection of St. Martin's Island's natural ecosystems, on which the local tourism industry and livelihood of inhabitants rely.

## Author Contributions

**Seema Rani:** Data Curation, Formal Analysis, Methodology, Writing – Original Draft; **Michael Bennett:** Investigation, Visualisation, Writing – Review & Editing; **Md. Kawser Ahmed:** Conceptualisation, Methodology, Project Administration, Resources, Supervision, Validation; **Xiongzhi Xue:** Data Curation; Investigation, **Keliang Chen:** Data Curation, Investigation; **Mohammad Shamsul Alam:** Data Curation, Investigation; **Antaya March:** Investigation, Writing – Review & Editing; **Pierre Failler:** Conceptualisation, Funding Acquisition, Resources, Supervision.

## Use of artificial intelligence (AI) tools

The authors declare they have not used artificial intelligence (AI) tools in the creation of this article.

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## Conflicts of Interest

Pierre Failler is an Editor in Chief for Green Finance and was not involved in the editorial review or the decision to publish this article. The authors hereby declare no conflicts of interest.

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