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The Economic Value of Coastal Resources in Barbados: Vacation Tourists' Perceptions, Expenditures and Willingness to Pay

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1 BACKGROUND

In November 2006 Dr. Peter W. Schuhmann, a natural resource economist from the University of North Carolina Wilmington met with a group of stakeholders at the Centre for Resource Management and Environmental Studies (CERMES) UWI-Cave Hill to discuss potential research priorities for his upcoming (2007) research sabbatical in Barbados. Attendees included individuals from UWI Cave Hill, the Barbados Ministry of Tourism, the Caribbean Tourism Organization, the Barbados Hotel and Tourism Association, the Environment Division and the Coastal Zone Management Unit. After a brief presentation on economic valuation of natural resources, the group discussed potential areas for research that would serve as a benefit to Barbados. Many areas for valuation work were discussed, including the value of beach width, beach cleanliness, coastal fisheries, marine protected areas and coral reef quality. The valuation of beach and reef characteristics to tourists and the economic impacts resulting from changes in quality were flagged as priority issues.

With funding provided by The Ministry of Tourism and in cooperation with the Caribbean Tourism Organization, a valuation survey instrument was designed and tested in the spring of 2007. In addition to collecting information on respondent characteristics and perceptions of their travel experience in Barbados, the survey included a choice modeling questionnaire designed to elicit tourist preferences and willingness to pay for lodging attributes, including characteristics of the beach nearest to the lodging location. This report summarizes the results of the survey and the accompanying econometric analysis.

2 DATA COLLECTION

In addition to the choice experiment (described in detail in section 6), the survey solicited a host of information regarding demographics, expenditures and recreational activities from respondents. Respondents were also asked to rate the quality of coastal and marine attributes that they encountered during their stay. A version of the survey is shown in Exhibit 2 at the end of this document.

The survey was administered to departing tourists at the Grantley Adams International Airport in the last week of May, June and July 2007, by survey workers from the Caribbean Tourism Organization (CTO). Of the 3,259 visitors that were interviewed, 2,492 (approximately 80%) were non-Barbados nationals visiting Barbados for the purpose of vacation or honeymoon, with the remainder visiting Barbados for business, conference or family reasons. Approximately four percent of those interviewed were Barbadian nationals living abroad. This report will focus on non-national vacation travelers only. Of the subsample of 2,492 non-national vacation travelers, 2,045 (82 percent) completed the choice experiment.

The sample appears to be representative of the Barbados tourist population in terms of age, country of origin, lodging choices and daily expenditures. The average length of stay in Barbados was 9.4 days. The majority of respondents stayed in large hotels (44 percent) or small hotels (21 percent). Approximately 35 percent of respondents stayed in all-inclusive hotels. Respondents predominantly stayed in beachfront locations (71 percent), or within a 2-3 minute walk to the beach (11 percent), and generally viewed beaches in Barbados as being of very high quality. Of particular interest for this study, though rated highly, beach width was viewed with less satisfaction than other characteristics. Respondents reported viewing an average of 2.8 pieces of litter per 25 meters of beach length.

2.1 Sample characteristics

The characteristics of the vacation sub-sample (henceforth "the sample") closely match those found in earlier work and reported by the Ministry or Tourism. The sample is representative of the Barbados tourist population in terms of age, lodging choices, length of stay and daily expenditures. Because our sample includes only air travelers, length of stay and total expenditure values are slightly different from the overall tourist population which includes cruise ship passengers.

3 COUNTRY OF ORIGIN AND OTHER DEMOGRAPHICS

The sample may over-represent tourists from the United States (32.8%) and the United Kingdom (50.7%) and under-represent Canadian visitors (4.5%) relative to annual arrivals in previous years. This discrepancy may be due to the timing of the survey (arrivals from the U.S. tend to be above average in the summer months while arrivals from Canada tend to be lower) or because we do not include cruise ship visitors. However, we note that these higher rates of visit from the U.S. and U.K. do correspond with recent trends in arrivals by destination. Country of origin for our sample is shown in Figure 1.

Over 55 percent of the sample was married. Our sample included more females (61%) than males. The average age of tourists in the sample was approximately 41 years. Tourists generally had a high level of education with more than 70 percent having completed some college education. Incomes were correspondingly high, with an average of approximately $US 121,000.[1] Only 3 percent of tourists sampled traveled to Barbados alone. Group size ranged from 2 to 54, with an average of 2.6 adults and 0.5 children. Over 63 percent were traveling with no children. Sample statistics for demographic variables are shown in Table 1.

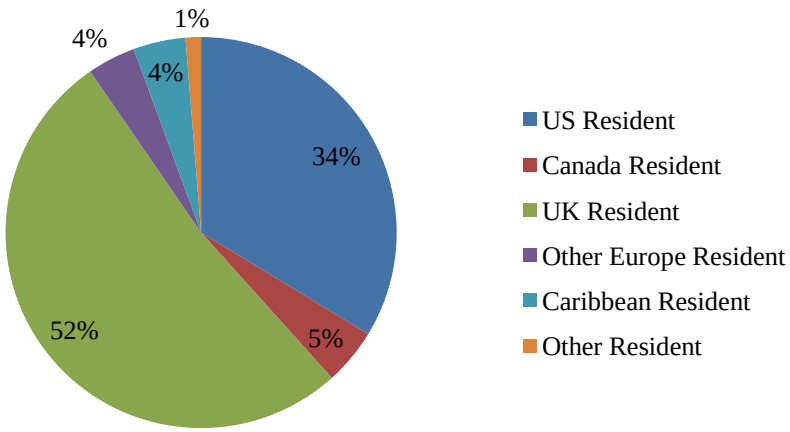

Figure 1: Country of origin for sample

[1] We note that this may be an underestimate of average income. To encourage response, the income question in our survey included checkboxes for various income ranges. Survey respondents also indicated the currency of measure. The top income range (180,000 and above) was coded as 180,000 for the purpose of calculations, resulting in a maximum income of US$360,000 when adjusted for currency. To the extent that the true maximum is higher than this, our estimate is biased downward.

Table 1: Demographic characteristics

Variable	n	Mean	Median	Standard Deviation	Minimum	Maximum
Age	2404	41.1502	45	13.5027	19	70
Male *	2492	0.3909	0	0.4880	0	1
Married *	2492	0.5550	1	0.4971	0	1
Annual Household Income (USD)	1829	120866.8	100000	82180.86	4761.9	360000

* Indicator variables can take on values of 0 or 1. The mean of these variables indicates the percentage of the sample that meets the indicated criteria.

3.1 Travel and lodging

Tourists in the sample travelled an average of nearly nine hours from their point of origin to their lodging in Barbados, and 20 percent experienced delays in travel en route. Over 63 percent of the sample was visiting Barbados for the first time, while nearly 35 percent were visiting the Caribbean for the first time. The 918 tourists who had visited Barbados previously had been to Barbados more than six times on average. The average length of stay for the sample was 9.4 days, with the majority of respondents staying in large hotels (43 percent) or small hotels (21 percent) and predominantly staying in beachfront locations (71 percent) or within a 2-3 minute walk to the beach (11 percent). Only 12 percent of those interviewed indicated that this trip included visits to other islands. Tourists in the sample also indicated taking over 2 trips for vacation in the past 12 months on average, not including the present trip. Approximately half of those surveyed came to Barbados on a prepaid package. Sample lodging type is shown in Figure 2. The proximity of lodging to the beach for the sample is shown in Figure 3. Other sample statistics for travel and lodging variables are shown in Table 2.

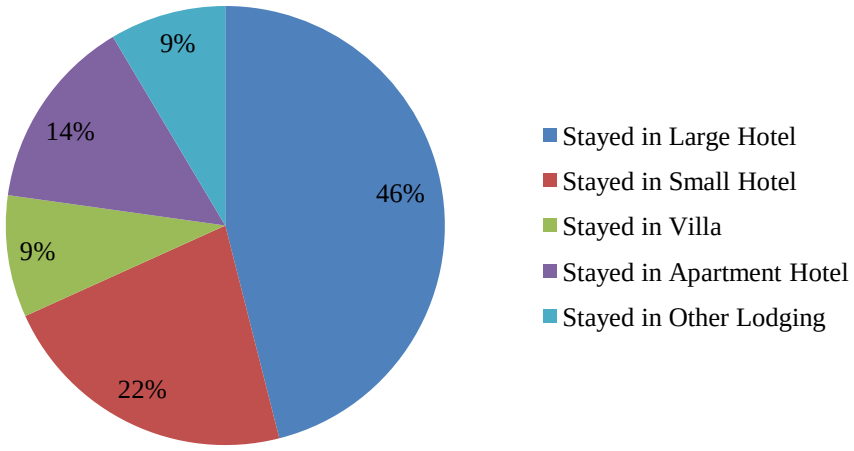

Figure 2: Lodging type

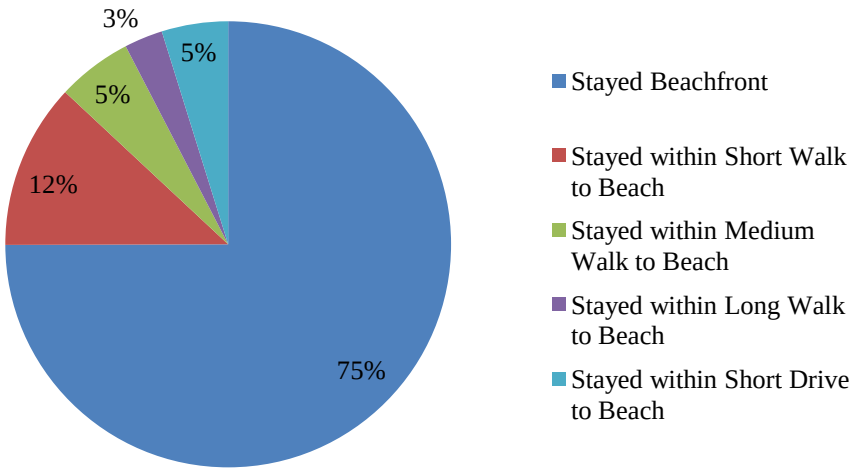

Figure 3: Proximity of lodging to beach

Table 2: Other travel and lodging characteristics

Variable	n	Mean	Median	Standard Deviation	Minimum	Maximum
First Visit to Barbados *	2490	0.6313	1	0.4825	0	1
Number of Times to Barbados	2490	2.3393	0	8.9644	0	145
First Visit to Caribbean *	2448	0.3472	0	0.4762	0	1
Number of Times to Caribbean	2479	4.9205	1	13.9945	0	218
Visiting Other Islands this Trip *	2473	0.1205	0	0.3256	0	1
Total Vacations this Year	2308	2.3237	2	12.7792	0	566
Nights in Barbados this Trip	2483	9.3721	7	8.2998	0	217
Number of Adults in Party	2426	2.6142	2	3.1914	0	50
Number of Children in Party	2135	0.5603	0	1.5251	0	22
Hours Travelled to Barbados	2382	8.8902	9	6.5180	0	81
Experienced Delay in Travel *	2458	0.2002	0	0.4678	0	1

* Indicator variables can take on values of 0 or 1. The mean of these variables indicates the percentage of the sample that meets the indicated criteria.

3.2 Expenditures

Approximately 64 percent of the sample (roughly 1,600 individuals) responded to expenditure questions in the survey, yielding an average per person total trip expenditure of US$2477.00 not including airfare (Table 3). The majority of this (US$1146.00 per person per trip) was spent on lodging. Other significant expenditure categories included recreation activities (US$214.00 per person per trip), shopping (US$172.00 per person per trip), entertainment (US$166.00 per person per trip), and taxi/car rental/ground transport (US$104.00 per person per trip).

Daily expenditures average approximately US$300.00 per person, with slightly higher averages for residents from the U.K. and other European nations. This difference in spending stands in contrast to prior research (Barbados Tourism Policy Document, 2001) showing highest daily expenditures by U.S. tourists, and is likely a result of declines in the value of the U.S. dollar relative to the Euro and Pound in recent years.

Based on the preliminary estimate of 574,576 stop-over tourist arrivals in 2007 (Caribbean Tourism Organization, 2008) and assuming that our sample is representative of the entire tourist population for that year, stay-over tourists spent in excess of US$1.4 billion while in Barbados in 2007.

Table 3: Expenditures

Variable	n	Mean	Median	Standard Deviation	Minimum	Maximum
Travelled on Pre-Paid Package *	2492	0.5	0	0.5001	0	1
Made Advance Payments *	2492	0.174157	0	0.379321	0	1
Total Expenditure while in Barbados	1660	5304.55	3500	6325.73	1	100000
Total Expenditure per Person	1588	2476.94	1783	2352.95	0.3333	22664
Total Expenditure per Person per Day	1583	301.0477	226	286.9412	0.0238	3777.33
Total expenditure on Accommodation	1948	2444.02	1700	2642.57	0	26920
Accommodation Expenditure per Person	1869	1146.34	922.727	1047.62	0	11903
Price Paid per Night for Lodging (USD)	1685	181.7226	188	87.01641	37.5	301
Total expenditure on Meals	1619	754.6054	500	927.9061	0	10862
Expenditure per Person on Meals	1538	374.4605	250	421.75	0	4000
Total expenditure on Transport	1900	208.333	120	269.5414	0	4000
Expenditure per Person on Transport	1825	104.2362	60	146.3123	0	2200
Total expenditure on Recreation	1311	407.974	200	784.3024	0	10000
Expenditure per Person on Recreation	1261	213.8335	100	466.7657	0	6400

Total expenditure on Entertainment	1136	313.3684	100	652.9672	0	8000
Expenditure per Person on Entertainment	1084	166.0438	60	334.6496	0	3400
Total expenditure on Souvenirs	1368	169.6124	92	635.2019	0	20000
Expenditure per Person on Souvenirs	1324	88.6645	50	302.7646	0	8513.51
Total expenditure on Other Shopping	1192	358.5875	100	1279.23	0	30000
Expenditure per Person on Shopping	1154	172.6158	50	515.9725	0	10000
Total expenditure on Other	1787	220.6856	60	2400.6	0	100000
Expenditure per Person on Other (USD)	1731	88.16844	30	452.2295	0	16666.67

* Indicator variables can take on values of 0 or 1. The mean of these variables indicates the percentage of the sample that meets the indicated criteria.

3.3 Participation in Coastal and Marine Recreation Activities

Based on our sample data, tourist travelers to Barbados engage in a great deal of passive and active recreation activities related to the coastal and marine environment (Table 4). As might be expected, a large majority of visitors sunbathed (over 84 percent) or went swimming (over 82 percent) while on holiday. Approximately 50 percent of the tourists interviewed went snorkeling, with over 40 percent of the sample snorkeling from a boat, and over 27 percent of the sample snorkeling from shore. Roughly 19 percent of the sample snorkeled from both a boat and from shore. Much of the snorkeling involved encounters with marine turtles, as over 42 percent of the sample reported swimming with turtles.

Boating is also a popular recreation activity, with 40 percent of the sample engaged in some boating activity while on holiday. Sailing appears to be the most popular form of boating, with 30 percent of the sample engaged in this activity, and roughly 10 percent participating in power boating and 9 percent taking part in a glass-bottom boat trip. In terms of other marine recreation, approximately 22 percent of the sample went jet skiing,10 percent went SCUBA diving and approximately 7.5 percent went water skiing or on a glass-bottom boat ride. Notably, nearly 60 percent of the sample directly viewed the underwater marine environment in some way (via snorkeling, diving, glass-bottom boats or sub rides), with over 55 percent doing so while in the water snorkeling or diving. Similarly, over 60 percent of the sample was on the sea in a boat or jet ski at some point during their holiday.

Visitors to Barbados were active in visiting beaches around the island. Given that 71 percent of the sample stayed in beachfront lodging, and over 80 percent reported sunbathing or swimming, it is not surprising that over 90 percent reported visiting a beach on at least one of the four coasts while on holiday. Beaches on the west coast were the most popular, visited by over 66 percent of the sample. South, east and north coast beaches were visited by approximately 57 percent, 38 percent and 18 percent of the sample respectively. Nearly 51 percent of the sample reported visiting beaches on at least two coasts. The west and south coasts were predictably the most popular combination with approximately 37 percent of the sample, followed by the west and east

coasts with over 30 percent. Over 25 percent of the sample visited a beach on at least three coasts, with the west, south and east coasts being the most popular combination (over 22 percent). Finally, over 12 percent of the sample visited beaches on all four of the Barbados coasts.

Table 4: Participation in Marine and Coastal Recreation Activities

Variable	n	Mean	Median	Standard Deviation	Minimum	Maximum
Sunbathed *	2492	0.841894	1	0.364914	0	1
Went Swimming *	2492	0.823034	1	0.381717	0	1
Went SCUBA Diving *	2492	0.09992	0	0.299953	0	1
Snorkeled from Boat *	2492	0.401685	0	0.490337	0	1
Snorkeled from Shore *	2492	0.273275	0	0.44573	0	1
Went on Submarine Ride *	2492	0.074639	0	0.26286	0	1
Went Jet Skiing *	2492	0.220706	0	0.414806	0	1
Went Water Skiing *	2492	0.073435	0	0.260902	0	1
Played Golf *	2492	0.091092	0	0.287797	0	1
Went Boating (Power Boat) *	2492	0.10634	0	0.308335	0	1
Went Boating (Sail Boat) *	2492	0.298555	0	0.457716	0	1
Went on Glass-Bottom Boat *	2492	0.088283	0	0.283762	0	1
Went Boating (All) *	2492	0.40008	0	0.490013	0	1
Swam with Turtles *	2492	0.424559	0	0.494375	0	1
Went Fishing *	2492	0.058588	0	0.234898	0	1
Ate Fish/Seafood *	2492	0.613965	1	0.486937	0	1
Participated in Other Recreation *	2492	0.103531	0	0.304713	0	1
Viewed Underwater Marine Environment (All) *	2492	0.585072	1	0.492809	0	1
Visited West Coast Beaches *	2492	0.661316	1	0.473357	0	1
Visited South Coast Beaches *	2492	0.570225	1	0.495143	0	1
Visited East Coast Beaches *	2492	0.378411	0	0.485088	0	1
Visited North Coast Beaches *	2492	0.181782	0	0.385742	0	1

* Indicator variables can take on values of 0 or 1. The mean of these variables indicates the percentage of the sample that meets the indicated criteria.

3.4 Ratings of environmental quality

Survey respondents were asked to rate the quality of several coastal attributes using a 5-point scale, where 5 represented the highest quality and 1 the lowest quality. These attributes included the cleanliness of beaches, the quality of the beach sand, beach width, the cleanliness and visibility of the seawater, the ease of access to the sea, and the overall quality of the beaches. Visitors in our sample generally viewed these attributes as being of very high quality, with all attributes receiving an average rating of between 4 and 5 with the exception of beach width. On average, respondents rated the ease of access to the sea higher than all other attributes, though quality of the sand was also viewed very favorably. Average ratings are shown in Figure 4 with additional detail provided in Table 5.

Respondents were also asked to report the width of the beach and the amount of litter typically encountered per 25 meters of beach length nearest to their lodging. Each of these questions was presented in check-box format, with ranges for each check-box. Beach width ranges were 3-5 meters, 8-10 meters, 13-15 meters, 18-20 meters and more than 20 meters. Litter ranges were 0 pieces of litter per 25 meters, up to 5 pieces, up to 10 pieces, and 15 or more pieces. In order to calculate descriptive statistics for these variables, the mid-points of each range were assigned to each category, with the exception of the highest category which were coded at the corresponding maximum values (e.g. 21 meters for the category "more than 20 meters"), and the minimum value for litter which was coded as 0. Using these measures, average beach width experienced by respondents was nearly12.5 meters with a standard deviation of 6.34. Respondents reported viewing an average of 2.7 pieces of litter per 25 meters of beach length, with a standard deviation of 3.81. Average beach width nearest to lodging and litter encountered are shown in Table 5. It is notable that nearly 53 percent of the sample reported viewing no litter, and only 3 percent of the sample reported viewing 15 or more pieces of litter per 25 meters.

Correlation analysis reveals that respondents rating of beach width is moderately and positively correlated with reported beach width nearest to lodging (correlation coefficient = 0.23), yet actual beach width is only weakly correlated with the respondent's rating of the overall quality of the beach (correlation coefficient = 0.12). This indicates that wider beaches are generally viewed more favorably, but that beach width may not be a critical component of an individual's overall perception of beach quality. Also of note is a moderately strong positive correlation between viewing no litter and the rating of the overall quality of the beach (correlation coefficient = 0.24) and a moderately strong inverse correlation between viewing the highest category of litter and the rating of the overall quality of the beach (correlation coefficient =- 0.17). In short, and as might be expected, those who saw no litter tended to view beach quality more favorably, while those who encountered a lot of litter viewed beach quality less favorably.

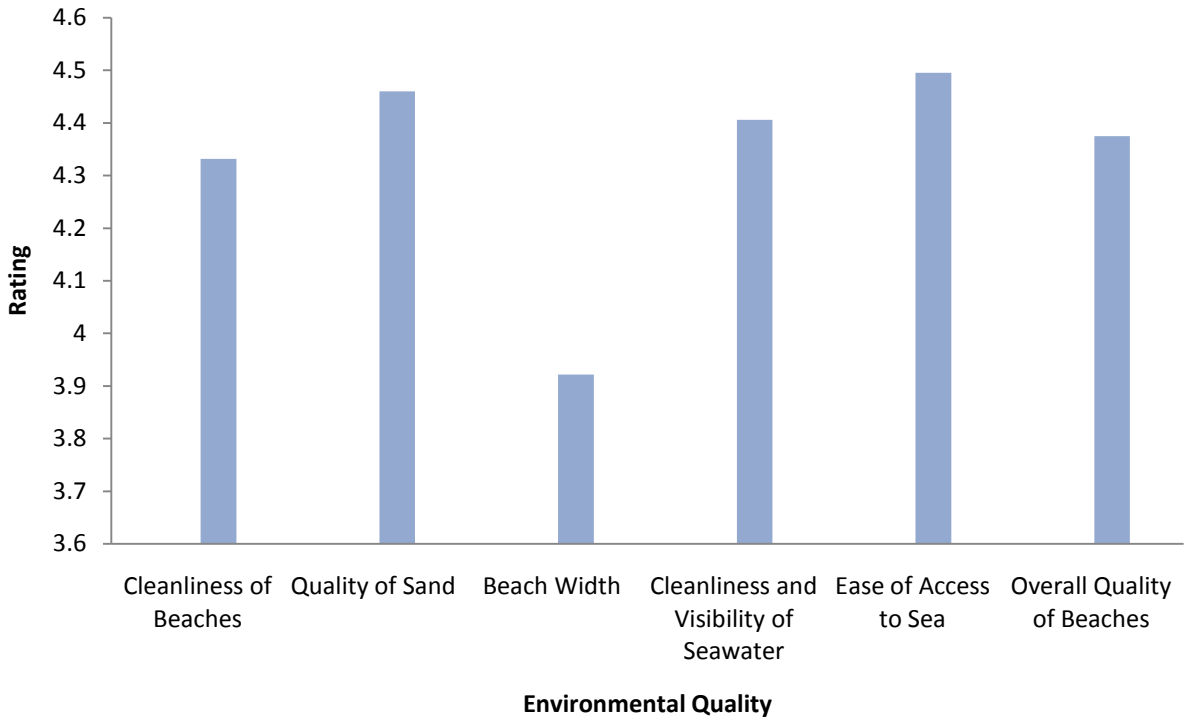

Figure 4: Average ratings of Coastal and Marine Quality (Scale: 1 = lowest, 5 = highest)

Table 5: Ratings of environmental quality

Variable	n	Mean	Median	Standard Deviation	Minimum	Maximum
Cleanliness of Beaches Rating **	2370	4.331646	5	0.796077	1	5
Quality of Sand Rating **	2372	4.460371	5	0.746502	1	5
Beach Width Rating **	2325	3.92172	4	1.018282	1	5
Cleanliness and Visibility of Seawater Rating **	2373	4.405815	5	0.798977	1	5
Ease of Access to Sea Rating **	2365	4.49556	5	0.806384	1	5
Overall Quality of Beaches Rating **	2361	4.374841	5	0.749934	1	5
Width of Beach Nearest Lodging (meters)	2172	12.39088	9	6.342415	4	21
Pieces of Litter Viewed per 25 Meters of Beach	2245	2.761693	0	3.81312	0	15

** Quality variables are based on a 5-point scale, where 5 represented the highest quality and 1 the lowest quality.

3.5 Stated Probability of Return

As part of the survey, departing tourists were asked to express the likelihood that they would return to Barbados as "Definitely", "Probably", "Probably not", or "Definitely not". As shown in Figure 5 below, a majority (56 percent) stated that they would definitely return to Barbados, while 37 percent indicated that they would probably return. Only six percent stated that they would probably not return, and only one percent indicated that they would definitely not return.

In order to gain insight into the determinants of the stated probability of return, the stated response of "definitely will return" was modeled using a logit regression. Generally speaking, this analysis revealed that among all the variables collected, the most significant factors explaining the "definitely will return" response were having previously visited Barbados, the perception of beach quality and seeing no litter.

A logit specification was also used to model the stated response of "definitely will NOT return". Despite the lack of variation in this variable across the sample (only one percent indicated this response), three highly significant factors were discovered: previously visiting the Caribbean, the stated perception of sand quality and the amount of litter viewed. Regarding the first of these variables, it may be the case that some tourists simply like to travel to new destinations rather than returning to places they've already visited. However, it may also be the case that visits to other destinations caused Barbados to be a less-preferred alternative. Unfortunately, with the information collected in the survey we have no of distinguishing between these alternative explanations. Future survey efforts could include follow-up question asking respondents to indicate the reasons for their stated probability of return.

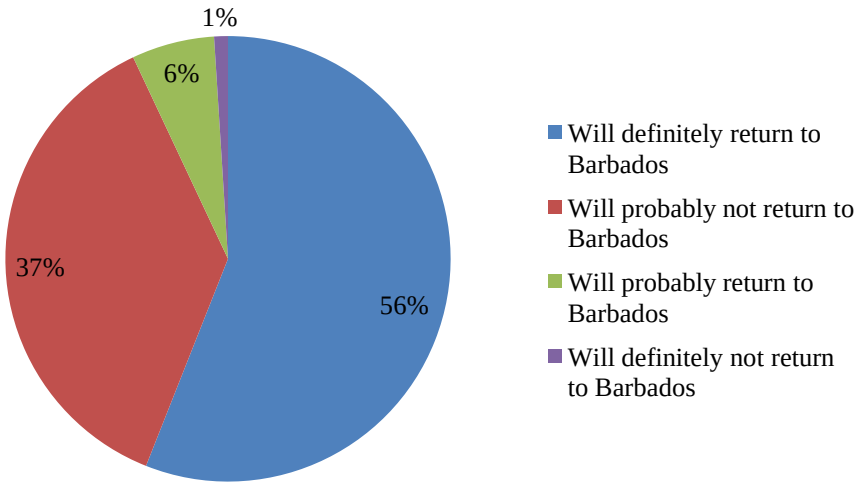

Figure 5: Stated Probability of Return to Barbados

Because tourists' probability of return was found to be highly dependent upon perceptions of coastal and marine quality, examining the factors that influence those ratings may lend additional insight. Such an examination is carried out in the next section.

4 MODELING INDIVIDUAL BEACH QUALITY RATINGS

Examining average quality ratings (as shown in Figure 4 and Table 5) is informative for understanding tourist perceptions of coastal and marine quality, but for policy purposes it may be more useful to gain an appreciation for the determinants of those ratings. As the quality ratings used in the survey instrument have a discrete natural ordering (low to high), but are not technically quantitative (that is, a one-unit change does not provide a meaningful continuous and quantitative interpretation, but are rather represents a convenient way of coding of qualitative information), we can use an *ordered logit regression model* to understand the importance of other factors in determining those ratings. For more information on logit models, see Chapter 21 of Greene (1993).

Using each of the six coastal and marine quality ratings as dependent variables, we can examine potential determinants of these ratings by including other factors of interest as independent variables. Several approaches can be employed in such a modeling effort. We can examine independent variables of theoretical or policy interest, variables that statistically contribute the most in terms of understanding variation in quality ratings, or groups of variables that combine to form the best predictor of quality ratings. The first two of these are of interest for the purposes of this study, as we wish to understand the importance of policy-relevant variables in determining visitors' ratings of environmental quality, and we wish to know the relative importance of these variables in influencing these ratings.

We proceed by modeling each of the five specific quality ratings (cleanliness of beaches, quality of sand, beach width, cleanliness and visibility of the seawater, and ease of access to the sea) as a function of the actual beach width viewed nearest to lodging, the actual amount of litter encountered nearest to lodging, and each of the four coastal visits variables, which indicate whether or not the individual visited beaches on that coast. We also examine whether beach activities such as sunbathing or underwater activities such as snorkeling or scuba diving affect quality ratings. Other variables of interest include the respondent's income, the type of lodging, the proximity of lodging to the beach, whether or not the respondent had previously been to Barbados and the number of times that the respondent has visited the Caribbean. These latter variables will indicate whether or not visitors from specific income groups or nations view coastal and marine quality differently, and whether or not those visitors who have been to other Caribbean islands view coastal and marine quality in Barbados differently than those who have not. We also model respondents' rating of the overall quality of the beaches as a function of the five individual quality ratings plus the aforementioned variables. Model results are shown in the first five columns of Table 6.

Respondents' ratings of the five aspects of beach quality are largely a function of the amount of litter viewed on the beach, the actual beach width encountered, and the number of times the respondent had been to the Caribbean. Other variables, including household income, whether or not this was the respondent's first trip to Barbados and the coastal visit variables also appear to affect ratings of some aspects of beach quality. Specifically, encountering less litter and wider beaches contributes to higher ratings for all five aspects of quality. In short, people seem to have significant preference for cleaner and wider beaches.

It is perhaps surprising that the amount of litter encountered influenced respondents' ratings of beach width quality, and that the width of the beaches encountered influenced ratings of beach and seawater cleanliness. It would likely be incorrect to state that more litter on the beach made

the beach appear smaller or that wider beaches appear cleaner. A more plausible explanation for this finding is likely that respondent ratings of various beach quality attributes tend to be highly correlated; hence those who viewed one aspect of beach quality as favorable were more likely to view other aspects in the same regard.

The number of visits to the Caribbean appears to significantly affect respondent ratings of all aspects of beach quality in a negative fashion. This result indicates that respondents with more Caribbean travel experience tend to view beach quality in Barbados less favorably than respondents with less Caribbean travel experience, and could therefore indicate that beach quality in Barbados is considered to be lower quality than other Caribbean destinations.

The coastal visits variables generally do not significantly affect beach quality ratings, indicating that respondents did not consistently view beach quality on any particular coast as being of better or worse quality than others. However, there are some notable exceptions. Specifically, having visited west or south coast beaches appears to adversely affect the rating of seawater cleanliness, with the affect more significant for the south coast beaches. Having visited south coast beaches also appears to positively affect respondent ratings of sand quality, indicating that respondents generally viewed sand quality as higher if they had visited beaches on the south coast. Further, when income is removed from the model (results available from the author upon request), the variables indicating visits to the west and south coasts become significant determinants of the beach width rating and the quality of sand rating. Notably, the west coast visit coefficient is negative and the south coast visit coefficient is positive. Given that the west coast is more upscale and expensive than the south coast, we can conclude either i) west coast beach width is viewed less favorably than other coasts while the south coast is viewed more favorably, or ii) respondents with higher incomes generally view the beach width in Barbados with less satisfaction than those with lower incomes. We suspect that the former of these is more plausible, but should recognize that ratings of beach width may be inversely related to income.

A similar effect was discovered regarding the number of visits to the Caribbean, which appears to significantly affect respondent ratings of all aspects of beach quality in a negative fashion when income is included in the model. When income is excluded, the coefficient on visits to the Caribbean becomes insignificant for the ratings of beach width, cleanliness of seawater and ease of access to the sea. Again, this indicates that when income is held constant, respondents view these aspects of beach quality in Barbados less favorably than other places in the Caribbean, but when income is allowed to vary, there is no such effect, indicating that tourists generally view these quality indicators in Barbados as similar to other islands that they have visited. The adverse effect of previous Caribbean visits on ratings of beach cleanliness and sand quality appear to be robust, regardless of whether income is included in the model.

Respondents who stayed beachfront appear to view beach width and seawater cleanliness less favorably than other respondents, but view the ease of access to the sea more favorably. The latter result appears intuitive: staying on the beach results in easier access to the sea, but the former results lack an obvious explanation. Finally, respondents who were on their first trip to Barbados appear to view beach width less favorably than respondents who had been to Barbados on a previous occasion.

5 MODELING OVERALL BEACH QUALITY RATING

Again using an ordered logit specification, we can examine the statistical determinants of respondents' ratings of overall beach quality. Of all the variables collected, the individual beach quality ratings proved to be the most statistically significant determinants of overall quality ratings. This result has an intuitive explanation. Respondent perceptions of the overall quality of beaches are largely a function of their perceptions of the five individual beach quality measures. Surprisingly, even with the five individual quality ratings included in the model (Model 4), the amount of litter encountered and the actual beach width viewed are statistically significant determinants of the overall beach quality rating. This is a notable result that highlights the impact that viewing litter and wide beaches has on respondent perceptions of beach quality.[2]

The number of prior visits to Barbados appears to positively affect respondent ratings of overall beach quality, indicating that those who visit Barbados more often view beach quality more favorably than others. Respondents who stayed in a large hotel tended to view beach quality less favorably, perhaps due to a crowding effect. Other variables of interest, including the four coast visits variables, household income, previous visits to the Caribbean and staying in beachfront lodging are insignificant when the five individual quality ratings are included in the model.

Partial modeling results are shown in Table 7. Importantly, the coefficient on the rating of beach cleanliness is nearly double the magnitude of the coefficients on the other quality ratings, indicating that beach cleanliness has the largest influence on respondent's rating of overall beach quality.

[2] Typically, when highly correlated variables are simultaneously included in a regression model, their individual effects are veiled, as is the case with income and west coast visits in the models above. This issue is called multicollinearity, and diminishes the analyst's ability to differentiate the individual effects that the correlated independent variables have on the dependent variable. However, in this case, it appears as though the effect of viewing litter and wide beaches on one's rating of beach quality is so strong, that even with this statistical veiling, the effect remains statistically significant.

Table 6: Ordered Logit Model Results for Beach Quality Ratings

	Coefficient (Standard Error)				
	Beach Width	*Beach Cleanliness*	*Sand Quality*	*Seawater Cleanliness*	*Ease of Sea Access*
Intercept 5	1.944**	1.311	0.984	2.869***	1.834**
	(0.829)	(0.878)	(0.901)	(0.890)	(0.928)
Intercept 4	3.407***	3.381***	3.007***	4.544***	3.377***
	(0.832)	(0.882)	(0.905)	(0.894)	(0.931)
Intercept 3	5.052***	5.629***	4.511***	6.131***	4.965***
	(0.837)	(0.900)	(0.916)	(0.904)	(0.942)
Intercept 2	6.873***	6.765***	5.778***	7.657***	5.676***
	(0.855)	(0.930)	(0.951)	(0.942)	(0.955)
Amount of litter viewed on beach	-0.065***	-0.22***	-0.108***	-0.066***	-0.071***
	(0.012)	(0.014)	(0.013)	(0.013)	(0.013)
Beach width viewed	0.075***	0.021***	0.044***	0.016**	0.029***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Visited west coast beaches	-0.152	0.045	0.043	-0.201*	-0.182
	(0.113)	(0.120)	(0.123)	(0.121)	(0.128)
Visited south coast beaches	0.089	-0.013	0.248**	-0.279***	-0.119
	(0.101)	(0.108)	(0.110)	(0.109)	(0.114)
Visited north coast beaches	-0.025	-0.047	-0.159	0.010	-0.074
	(0.132)	(0.140)	(0.144)	(0.141)	(0.147)
Visited east coast beaches	-0.058	-0.167	0.161	0.173	0.030
	(0.106)	(0.112)	(0.116)	(0.113)	(0.119)
Stayed in large hotel	0.021	-0.050	-0.225	0.099	-0.107
	(0.135)	(0.145)	(0.149)	(0.143)	(0.152)
Stayed in small hotel	-0.255*	-0.268*	-0.211	-0.070	0.042
	(0.145)	(0.154)	(0.159)	(0.153)	(0.163)
Stayed in villa	-0.287	-0.129	0.179	0.248	0.150
	(0.194)	(0.203)	(0.215)	(0.210)	(0.213)
Lodging beachfront	-0.481**	-0.147	-0.022	-0.524**	0.494**
	(0.213)	(0.222)	(0.233)	(0.236)	(0.226)
Lodging short walk to beach	-0.318	-0.212	-0.274	-0.502*	0.046
	(0.237)	(0.247)	(0.257)	(0.260)	(0.249)
Lodging medium walk to beach	-0.668**	-0.536*	-0.343	-0.462	-0.084
	(0.286)	(0.293)	(0.306)	(0.308)	(0.298)
First visit to Barbados	-0.307***	0.110	-0.145	-0.140	-0.123
	(0.104)	(0.110)	(0.113)	(0.110)	(0.117)
Sunbathed	-0.353**	-0.231	-0.201	0.040	-0.103
	(0.170)	(0.182)	(0.185)	(0.178)	(0.191)
Number of times to the Caribbean	-0.009**	-0.008**	-0.011***	-0.013***	-0.011***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Engaged in recreation where underwater was viewed	0.015	0.056	0.054	-0.099	-0.066
	(0.102)	(0.109)	(0.111)	(0.109)	(0.115)
Log (household income)	-0.198***	-0.048	-0.051	-0.151**	-0.107
	(0.070)	(0.074)	(0.076)	(0.075)	(0.079)
n	1610	1629	1632	1632	1629
AIC	4212.32	3211.16	3076.59	3351.18	3031.14

*** indicates statistical significance at the 1% level (highly significant), ** indicates statistical significance at the 5% level (somewhat significant), * indicates statistical significance at the 10% level (marginally significant), n indicates sample size. AIC is a measure of goodness of fit, with lower value corresponding to better fit.

Table 7: Ordered Logit Model Results for Overall Beach Quality Rating

	Coefficient (Standard Error)			
	Model 1	*Model 2*	*Model 3*	*Model 4*
Intercept 5	-21.526***	-21.586***	-21.532***	-21.9268***
	(0.6986)	(0.7029)	(1.307)	(0.787)
Intercept 4	-16.716***	-16.756***	-16.656***	-16.9433***
	(0.5847)	(0.5883)	(1.2298)	(0.664)
Intercept 3	-12.614***	-12.654***	-12.584***	-12.7238***
	(0.5217)	(0.526)	(1.1879)	(0.596)
Intercept 2	-10.612***	-10.641***	-10.835***	-10.9772***
	(0.5904)	(0.593)	(1.2137)	(0.649)
Beach Cleanliness Rating	1.575***	1.602***	1.6037***	1.5569***
	(0.0876)	(0.089)	(0.1019)	(0.100)
Sand Quality Rating	0.844***	0.829***	0.8655***	0.9257***
	(0.0923)	(0.093)	(0.1064)	(0.100)
Beach Width Rating	0.763***	0.771***	0.7570***	0.7568***
	(0.0621)	(0.062)	(0.0717)	(0.068)
Seawater Cleanliness Rating	0.862***	0.863***	0.8179***	0.8314***
	(0.0765)	(0.077)	(0.0857)	(0.081)
Ease of Sea Access Rating	0.850***	0.861***	0.9466***	0.8991***
	(0.0713)	(0.072)	(0.0839)	(0.076)
Number of times to Barbados		0.012*	0.0101*)*	0.0114*
		(0.007)	(0.0085)	(0.0067)
Stayed in a Large Hotel		-0.212**	-0.2666	-0.2451**
		(0.108)	(0.1245)	(0.115)
Log(income)			-0.0303	
			(0.0894)	
Actual Litter Viewed				-0.0379**
				(0.016)
Actual Beach Width Viewed				0.0159*
				(0.0093)
n	2302	2300	1735	2063
AIC	2448.807	2443.008	1837.95	2175.230

*** indicates statistical significance at the 1% level (highly significant), ** indicates statistical significance at the 5% level (somewhat significant), * indicates statistical significance at the 10% level (marginally significant), n indicates sample size. AIC is a measure of goodness of fit, with lower value corresponding to better fit.

To summarize, this analysis conclusively illustrates two fundamental results: (1) tourists' stated probability of return is highly dependent upon perceptions of beach quality, and (2) perceptions of beach quality are largely a function of the amount of litter viewed, the beach width viewed, and previous travel in the Caribbean region. After a brief primer on the notion of economic value, we estimate the economic value to tourists associated with alternative levels of beach quality.

6 THE ECONOMIC PERSPECTIVE OF VALUE, COSTS AND BENEFITS

Economists define the value of a particular good or service as what it is worth to people as determined by what people are willing and able to pay for that good or service. In this regard, value is often confused with cost. Cost, or what people have to actually pay for a good or service,

is considered expenditure and may differ greatly from the value of the good or service. For example, a beach renourishment project may involve $1 million in physical and engineering costs, but may generate considerably more (or less) than that in actual economic value.

It is important to recognize that economic value extends beyond the marketplace to "nonmarket" goods and services such as clean water, wide beaches, and healthy reefs. That people are willing to give up time or other resources (including money) for the opportunity to consume these goods and services lends evidence to this notion. Further, the economic value of these goods need not be associated with direct use. That is, value can be comprised of both use values and "nonuse values". The values associated with catching fish for consumption or snorkeling with turtles are examples of use values associated with the sea, while the value that people derive from knowing that the reef ecosystem exits for future possible use, or for future generations, are examples of non-use value.

6.1 Economic Valuation

Economic valuation simply means estimating what something is worth to people. We can gather what the worth of a good or service is by observing what the most people are willing to give up (i.e., trade) to attain it. Economic valuation facilitates this comparison by expressing all impacts in monetary units. There are many situations where measuring and understanding the value of particular natural resources can be useful. In general, anytime there is a potential for tradeoff between market values and non-market values, economic valuation can serve as a means of facilitating this comparison. This is based on the fact that alternative uses of natural resources create a range of impacts, which are usually not in comparable units (changes in fish stocks, loss of tourists, water or air quality changes, or reef degradation). Evaluation allows one to compare these often disparate factors and impacts in with a common metric, money.

When the impacts of a given policy change or action occur through markets (such as costs associated with construction, or the benefits of created jobs), monetization is relatively straightforward. These values can be derived using the appropriate demand curve and estimated changes in market prices and quantities. The estimation of non-market values (especially those associated with non-use), while much less known outside the economics profession, is facilitated by well-established valuation techniques. A brief discussion of the more popular and, for the purposes of this research, practical techniques are presented below (for an in depth discussion on the full range of methods and the history of non-market valuation, see Bockstael, McConnell, and Strand (1989), and Bockstael, Hanemann, and Kling (1987)).

6.2 Revealed preference methods

Revealed preference methods include the travel cost method (TCM) and hedonic pricing (HP). These methods examine decisions that individuals make regarding market goods that are used together with non-market goods to reveal the value of the non-market good (Kahn, 1998). These methods require that a link be established between changes in the environmental resource and changes in the observed behavior of people. For instance, changes in beach width or reef quality may result in tourists moving to another location or taking fewer trips. With this information, a demand or marginal willingness to pay function can be estimated, which allows one to estimate the value of particular changes in the natural resource.

The Travel Cost Method (TCM), one of the most widely used revealed preference valuation techniques, uses information on actual behavior to estimate a trip demand curve from which the

value of the resource can be derived. The demand curve is estimated using visitation data, including travel costs and the number of trips taken by each individual to a particular site. Using distance traveled as a proxy for the price of a trip, and the number of trips as the quantity, individual or group demand curves can be estimated for a site or destination. The net benefits of a particular site or the value of the resources within each site can then be estimated. With a modification for international travel, this method could similarly be employed to value the flow of recreation services from coastal and marine resources in Barbados. Application would require a detailed survey of individuals who travel to Barbados and use these resources.

This method has been used by government and non-government agencies alike around the world to value a wide variety of non-market goods and services, including coral reefs in Vietnam (Nam and Son, 2001), hiking in US National Forests (Hesseln et al. 2004), canoeing in Canada (Hellerstein, 1991), hunting in California (Creel and Loomis, 1990), Chinook Salmon sport fishing in Alaska (Layman, Boyce, and Criddle 1996), and ecotourism and wildlife viewing in Costa Rica and Kenya (Menkhaus and Lober 1996; Navrud and Mungatana 1994), just to name a few.

The HP method recognizes that natural resource values will be reflected in the prices people pay for composite goods such as housing. For example, housing prices along the coastline tend to exceed the prices of inland homes because beaches provide recreational and amenity values to coastal property owners. Hence, when people buy a house, the price they pay not only reflects the materials that went into constructing that house, the price reflects the number of bedrooms, square footage, whether there is a garage, neighborhood characteristics, and environmental characteristics and amenities. By collecting data on house characteristics and associated environmental attributes, the value of environmental amenities or changes in them can be estimated. Landry et al (2003), for example, use the HP method to estimate the economic benefits of increased erosion protection to coastal property owners in Tybee Island Georgia.

6.3 Stated Preference Methods

Stated Preference Methods include the Contingent Valuation Method (CVM) and Choice Modeling (CM, also referred to as Conjoint Analysis). While the revealed preference methods outlined above allow for the estimation of the value associated with recreation activities and property, such analyses do not permit the estimation of changes in values not associated with direct use (i.e. the non-use values described above). For example, tourists and residents may place value on the knowledge that the reef ecosystem and its wildlife are preserved in a particular way. To elicit such values, stated preference methods must be employed. CVM relies on direct survey questions to elicit values, while CM asks people to rank their preferences for alternative goods, rate alternative goods or make choices across bundles of goods. These goods are described in terms of various attributes or features, including price, which allows the researcher to estimate the value of the other attributes. This method was established in the marketing of new products and in transportation, and recognizes that most goods, including environmental goods, are composite goods comprised of a variety of attributes or characteristics, and that these characteristics can take a range of levels. The choice of a car for example, is really a choice of engine type, fuel efficiency, body type or style, interior amenities, transmission type, and of course price.

Both of these techniques are well-accepted methods for valuing non-market goods and services and have been used around the world. As early as 1994, the CVM method has been used in over

1600 studies and 40 countries (Carson et al. 1994). The U.S. Department of Interior (DOI) has adopted CVM to measure non-market values associated with damages under CERCLA 1980 (DOI 1986), while NOAA has endorsed the use of this method for damage assessment under the Oil Pollution Act of 1990 (Arrow et al. 1993).

The goal of CVM is to create a realistic, albeit hypothetical, market where peoples' values for a good or service are expressed. A CVM survey constructed for deriving non-use values consists of four main elements: a description of the program the respondent is asked to value or vote upon (e.g. a conservation project); a mechanism for eliciting value or choice (e.g. a simple referendum type question that asks the respondent to vote "yes" or "no" to a specified price); a "payment vehicle" describing the manner in which the hypothetical payments are collected (e.g., higher taxes or a payment into a trust fund); and information on respondent attitudes and characteristics (e.g., socioeconomic characteristics and environmental attitudes). This exercise could be undertaken via an in-person or mail survey of residents and tourists to ascertain the value of a particular resource.

While CVM is a powerful and useful tool in deriving value estimates for natural resources, a CM approach may be more useful in terms of determining the factors that contribute to tourists' destination choice and avoids an array of biases that confound most CVM studies. Moreover, CM allows multidimensional attribute changes to be valued simultaneously. These features make CM the most appealing valuation method for the purposes of understanding tourists' preferences for coastal attributes, as a tourist's destination choice can be thought of as the selection of a destination from a set of alternatives, and that selection is determined by numerous factors including the attributes or characteristics of the destinations. The choice modeling approach can therefore be used to analyze destination choices on the basis of the attractiveness of destination and trip attributes, and perhaps most importantly can be used to generate estimates of the relative value of multiple attributes (Huybers, 2004).

The data for a CM analysis is obtained from a survey designed to elicit preferences by guiding the respondent through a series of alternative goods, each described in terms of different levels of attributes that comprise the good. Respondents are asked to rank alternatives, rate them or choose between them. Surveys involving rating or ranking of alternatives are typically referred to as Conjoint Analysis (CA), while choices between two or more alternatives may be referred to as Discrete Choice Experiments (DCE). The latter more accurately simulates actual market behavior and permits estimation of attribute values via the rigorous but tractable multinomial logit model (Haider and Rasid, 2002).

For a CM DCE the descriptions of alternative goods vary across scenarios (and potentially across respondents) on the basis of an experimental design intended to maximize the efficiency of estimating respondent preferences for attributes of the goods. By collecting data on respondent choices over mutually exclusive alternatives with varying characteristics, the effect of the attributes on the choices can be derived (Huybers, 2004). Specifically, using the discrete choices as a dependent variable and levels of the attributes as the independent variables, multinomial logit regression can be employed to estimate the relative importance of attributes and levels within attributes. This measure of relative importance, referred to as the *marginal rate of substitution*, shows consumers willingness to trade one attribute level for another. Because one of the attributes is price, the marginal rate of substitute between other attribute levels and price can be considered a measure of value or willingness-to-pay for that attribute level. Box 1 below

shows an example of a single paired choice. In practice, each survey respondent faces several of these paired choices.

Box 1: Example of a single paired choice

Suppose that you could only choose from the lodging options below (Trip A, Trip B or neither trip). If all other factors were equal, which would you prefer?		
ATTRIBUTES	OPTION A	OPTION B
Price ($US)	$75	$225
Lodging Type	Small Hotel	Apartment/Apartment Hotel
Beach Width	3-5 Meters Wide	13-15 Meters Wide
Distance to Beach	12-15 Minute Walk	6-8 Minute Walk
Beach Litter	0 Pieces Litter per 25 Meters	10 Pieces Litter per 25 Meters
I prefer…(check **one** box below)		
□ **I WOULD NOT TAKE EITHER TRIP**	□ **TRIP A**	□ **TRIP B**

7 VALUATION OF BEACH CHARACTERISTICS USING A CHOICE MODELING DISCRETE CHOICE EXPERIMENT

A CM DCE questionnaire was developed for Caribbean holiday destination choices in order to understand tourist preferences and willingness to pay for coastal attributes such as beach width and beach cleanliness. As detailed in Hanley, Mourato and Wright (2001), there are several steps involved in the design of a CM DCE. First, attributes of the good to be valued must be selected based on policy concerns and/or interviews with focus groups. Because choices between products comprised of multiple attributes may be difficult of respondents to process, it is important to keep the number of attributes and levels to a manageable number. At the same time the CM survey design must ensure that price and policy-relevant attributes are included and that suitable designs can be constructed to estimate the values of concern. A design with five attributes each with four levels, has been shown to be cognitively manageable and permits the estimation of non-linear main effects for each of the attributes, and was chosen for our design.

In order to ascertain the attributes that holiday travelers considered the most important, a short survey instrument was designed and administered to approximately 130 departing tourists at GAIA. Respondents to this initial survey were presented a list of 30 beach and lodging attributes and asked to rate the importance of each attribute in influencing their holiday destination choice on a scale of 1 to 5. Respondents were also asked to indicate which single attribute was the most important for their destination decisions. Price and the level of service provided by the lodging staff were identified as the two most important attributes, and were closely followed by cleanliness of the beach nearest to the lodging. Cleanliness of the sea water, distance from lodging to the beach, type of lodging, quality of the sand, ease of access to the sea from the shore and the presence of shade and paths comprised the remainder of the top-ten most important attributes identified by respondents. Beach width, a priority attribute for the steering committee, was the 18th most important attribute identified.

7.1 Experimental Design

Policy variables of concern to the steering committee took precedence in our choice of attributes; hence beach width, beach cleanliness and price were selected as attributes to be included in the CM DCE experiment. Although identified as highly important to travelers, staff service quality was not a primary concern of this study. The value of cleanliness/visibility of the sea water, while also obviously important, is being estimated separately using another CM DCE administered to tourists directly engaged in marine recreation. Hence, we selected proximity of the lodging to the sea and type of lodging as the final two attributes for inclusion in our study.

Once a suitable list of attributes has been identified, levels of those attributes must be assigned. These levels should be realistic and should span the range of respondent preferences (Hanley, Mourato and Wright, 2001). We therefore chose our attribute levels based on actual values for each of the attributes. Beach widths in Barbados were identified using data from the Coastal Zone Management Unit. Beach litter was counted and logged by the author at sample beaches across the island. Lodging prices and types were provided by the Barbados Ministry of Tourism, while distances from lodging to the sea were identified after consultation with tourism officials. A full list of attributes and levels is presented in Table 8.

Table 8: Destination choice attributes and levels

Attributes	Levels
Price ($US/night)	$75, $150, $225, $300
Lodging Type	Small hotel, Large hotel, Apartment hotel, Villa
Beach Width (meters)	3-5 meters, 8-10 meters, 13-15 meters, 18-20 meters
Distance to Beach	Beachfront, 2-3 minute walk, 6-8 minute walk, 18-20 minute walk
Beach Litter (pieces per 25 meters)	0, 5, 10, 15

The attributes and their levels must next be combined to create alternative versions of the good in question. These alternative versions are then paired into alternative choices between versions to be presented to respondents in such a way as to maximize the statistical efficiency with which the value of attributes and levels are estimated. This aspect of the CM DCE, referred to as the "experimental design" is complex, as the attributes and levels can be combined to create numerous versions of the good, and these versions can be paired numerous ways. For example, with five attributes each having four levels, there are 1024 possible combinations of attributes and levels yielding ((1024!) / 2 (1022!)) possible pairs[3].

The key to experimental designs is to select a subsample of pairs from this "full factorial" to present to respondents in a cognitively manageable way, while at the same time maintaining statistical power for estimating the effects of the attributes and their levels on choices ("main effects"). Sufficiently large designs may also permit the estimation of the effect of different combinations of attributes and levels on choices ("interaction effects"). This additional estimation power requires that respondents face more choices and therefore carries the risk of survey respondent fatigue. To overcome this difficulty, large "partial factorial" designs can be divided into sub-sets or "blocks" that are shown to different groups of respondents. For the

[3] In general, there are $n! /k!(n-k)!$ combinations of k objects from a set of n possible objects.

purposes of this research, 96 pairs were selected from the full factorial design and blocked into 16 sets of six paired choices using the %choiceff and %mktblock macros in SAS (Kuhfeld, 2002). To more accurately replicate actual market decisions, a "neither option" alternative was also included for each choice. In summary, each respondent faced six scenarios depicting the choice between two alternative trips, and could select "neither trip" for each of the six choices.

7.2 Random Utility Theory

Analysis of CM DCE data is based on the assumptions of the general discrete choice model or random utility model (RUM) first introduced by McFadden (1974) and originally used for analysis of revealed preferences. This model recognizes that an individual's satisfaction or "utility" from a given choice will be a function of observable and unobservable characteristics. That is, from the perspective of the researcher, there is a random component to utility. As such, the utility derived by an individual from a particular alternative (i) can be represented by a function that contains a deterministic component (Vi) and a random component (ei):

(1) $U_i = V_i + \varepsilon_i$

If an individual chooses alternative (i) over another alternative (j) this implies that the utility from the former outweighs that from the latter. i.e. choice of (i) over (j) implies $U_i > U_j$.

Since the utilities include a stochastic component, we can describe the probability of choosing alternative (i) as:

(2) $P\{i\} = P\{V_i + \varepsilon i > V_j + \varepsilon_j\}$

Assuming the stochastic elements of the choice alternative utilities follow a Gumbel distribution, the standard multinomial logit (MNL) model can be specified to facilitate estimation of the probability of choosing alternative (i) (McFadden 1974; Ben-Akiva and Lerman 1985).

(3) $P\{i\} = \exp(V_i) / \sum \exp(V_j)$

7.3 Estimation

Estimation of the model outlined above requires the specification of a functional form for the indirect utility function (1) and the identification of observable variables which are likely to influence the choice in question. With regard to the latter, we use the five lodging choice attributes described in Table 8 above (price per room, lodging type, proximity of lodging to beach, beach width, and presence of litter). With regard to model specification, we assume that the indirect utility function is linear (additive) in price and the quality attributes.

By specifying a baseline level for each attribute, MNL regression allows the estimation of unique coefficients for the remaining levels. These coefficient estimates are referred to as "part-worth utilities", and represent the utility derived from a particular attribute level compared to a baseline (omitted) level. For the purposes of this report, the baseline levels are set at the best case scenario: staying in a beachfront villa on a very wide beach with no litter. Unlike the other attributes, the price variable is treated in a continuous fashion. That is, using responses from the 2045 tourists who completed the choice experiment portion of the survey, we can estimate equation (1) as:

(4) $U_i = \beta_1(\text{Price}_i) + \beta_2(\text{lodging type}_i) + \beta_3(\text{distance to beach}_i) + \beta_4(\text{beach width}_i) + \beta_5(\text{litter}_i)$

Where:

lodging type = Small hotel, Large hotel, or Apartment hotel,
distance to beach = 2-3 minute walk, 6-8 minute walk, or 18-20 minute walk,
beach width = 3-5 meters, 8-10 meters, or 13-15 meters,
and litter = 5 pieces, 10 pieces, or 15 pieces.

7.4 Results

Multinomial logit estimates of equation (4) are shown in Table 9. With the exception of the coefficient on 13-15 meter beach width, all coefficients are of the expected sign, and all coefficients are statistically significant at the 1 percent level with the exception of the coefficients on 8-10 meter and 13-15 meter beach widths. Further, the magnitude of the beach litter and distance from the beach coefficients changes in the expected direction – tourists lose more utility with higher levels of litter and greater distance from their lodging to the beach. These results indicate that tourists strongly prefer staying in lodging that is closer to the beach and strongly prefer beaches with less litter. Tourists also view villa lodging as favorable to other lodging types. With regard to beach width, it appears that tourists are significantly averse to the narrowest of beaches (3-5 meters wide), but do not place additional utility on beaches wider than 5 meters. That is, tourists are equally satisfied with beaches in the widest three categories.

7.5 Willingness to pay

The single coefficient on price represents the marginal utility of income and can be used to derive the value or willingness to pay for each level of the remaining attributes relative to the baseline level as:

(5) WTP for attribute level a $= - \beta_a / \beta_1$

Applying equation (5) to the coefficients for beach litter, beach width and proximity to the beach reveals the average willingness to pay to *avoid* levels of these attributes relative to the baseline "best case" scenario of staying at a beachfront villa on a very wide beach with no litter. These values are presented in Table 10.

To put these values in context, the average travel group size for tourists in our sample was 3, and the average price paid per room was roughly US$164. Further, average beach width was approximately 12 meters and tourists encountered an average of 3 pieces of litter per 25 meters of beach length. Clearly, tourists strongly and significantly favor wider beaches with minimal litter. The also exhibit a clear preference for staying beachfront.

All effects appear to be non-linear. Specifically, the most pronounced differences in willingness to pay to avoid litter are at the lower end of the litter spectrum. That is, once a beach is "dirty", the loss in value per unit of additional litter is smaller than when litter is added to a relatively clean beach. Given the magnitude of the willingness to pay values at the high end of the litter spectrum relative to the range of most room rates in Barbados, it would not be unreasonable to state that once litter reaches a level of more than 10 pieces of litter per 25 meters of beach, tourists will likely go elsewhere. Tourists also have a significant aversion to narrow beaches, but do not seem to place much value on additional width beyond 8-10 meters. As expected, tourists also strongly prefer beachfront lodging. Given the magnitude of the willingness to pay values, it seems reasonable to suggest that a majority of tourists would not make the trip if they could not stay beachfront.

Table 9: Multinomial Logit Estimates for Choice Model

Attribute	Level	Coefficient (Standard Error)
Price	Continuous	-0.00157*** (0.000184)
Beach Litter	5 pieces per 25 m	-0.36253*** (0.04321)
	10 pieces per 25 m	-0.80998*** (0.04449)
	15 pieces per 25 m	-0.98313*** (0.04393)
Beach Width	3-5 meters	-0.13571*** (0.04525)
	8-10 meters	-0.02411 (0.04327)
	13-15 meters	0.02332 (0.04395)
Lodging Type	Small Hotel	-0.2489*** (0.04492)
	Large Hotel	-0.28958*** (0.0443)
	Apartment Hotel	-0.18812*** (0.04551)
Proximity to Beach	2-3 minute walk	-0.39787*** (0.04231)
	6-8 minute walk	-0.71373 *** (0.04373)
	18-20 minute walk	-1.10245*** (0.04559)

*** indicates statistical significance at the 1% level (highly significant).

Table 10: Willingness to pay to avoid attribute levels relative to baseline "best case" scenario

Attribute	Level	Willingness to pay to avoid attribute level relative to baseline "best case" (US dollars per room)
Beach Litter	5 pieces per 25 m	$231
	10 pieces per 25 m	$516
	15 pieces per 25 m	$626
Beach Width	3-5 meters	$86
	8-10 meters	$0
	13-15 meters	$0
Proximity to Beach	2-3 minute walk	$253
	6-8 minute walk	$455
	18-20 minute walk	$702

7.6 Interaction Effects

Interacting litter and beach width levels with demographics, permits a description of how the willingness to pay values vary among different subsets of the sample. For example, there is a significant interaction effect between income and willingness to pay to avoid litter - those with higher incomes are more averse to litter and are willing to pay more to avoid it. There is also an interaction effect between some countries of origin and willingness to pay to avoid litter. Specifically, residents of the UK are considerably more averse to the higher levels of litter, while residents of the US and the Caribbean appear to be less averse to litter. The "UK premium" is roughly 16% for avoiding the second highest level of litter and over 20% for avoiding the highest level.

Hence, to the extent that our sample of summer respondents contains a disproportionate amount of tourists from the UK relative to the annual visitation from the UK, the willingness to pay values to avoid the highest levels of litter may be biased upwards in terms of representing the overall tourist population.

It is important to note that even with a correction for such bias, the willingness to pay values are still considerably large. In short, the aversion to litter on the beach is very strong and very significant.

7.7 Interpretation

The willingness to pay values shown in Table 10 represent lost economic value for those who experience those conditions. These values can be interpreted as the amount of value (be it value in dollars or other goods and services) that respondents would require to make up for dirty or narrow beaches. The willingness to pay values for avoiding the high end of the litter spectrum are so large that it seems reasonable to assert that most visitors' reservation price (maximum willingness to pay) would be surpassed, so that, if given the choice, most would tourists simply not purchase the trip all. Unfortunately, our survey was not designed to allow for an empirical examination of reservation prices.

We can use the relative values of willingness to pay to avoid attribute levels to discuss tradeoffs that tourists would be willing to make. For example, while tourists strongly prefer beachfront lodging, it appears as though they would be equally satisfied with a 2-3 minute walk to a clean beach and beachfront lodging at a marginally dirty beach, and would be more satisfied with a 6-8 minute walk to a clean beach than staying beachfront at a beach with a high level of litter. Understanding such tradeoffs may have important implications for coastline development. Recognizing that continued or additional beach front development is limited by land availability and may in itself be detrimental to the coastal and marine environment, policy makers should recognize that tourists appear willing to forgo the beachfront amenity in exchange for clean (and wide) beaches.

Just under half of the sample reported viewing some degree of beach litter. Based on this analysis, it is clear that this litter creates significant economic costs to holiday tourists and diminishes their probability of return. Losing potential return visitors creates real economic costs for the economy of Barbados. By extension we can conclude that beach clean-up efforts create significant economic value. Using conservative estimates of value, keeping the beaches relatively free of litter could generate tens of millions of dollars in economic value annually.

8 SUMMARY AND CONCLUSIONS

With support from the Ministry of Tourism and The Caribbean Tourism Organization, a survey was developed and administered to departing tourists at the Grantley Adams International Airport in the last week of May, June and July 2007. Over 3,250 visitors were interviewed, of which 2492 (just over 76 percent) were non-Barbadian national vacation travelers. Of this subsample, 2045 (82 percent) completed the choice experiment. Empirical analysis of the survey data revealed several notable conclusions.

First, tourists' probability of return is highly dependent upon their perceptions of coastal and marine quality. Most tourists that completed the survey indicated that they would definitely return (56 percent) or would probably return (37 percent). Modeling these stated responses using logit regression revealed that the stated perception of sand quality and the amount of litter viewed (as well as having previously visited the Caribbean) were the most important determinants of return among all variables studied. Visitor's perceptions of coastal and marine quality are, in turn, highly dependent upon amount of litter viewed and the width of beaches encountered. Hence, there is a clear and significant link between the quality of the coastal and marine environment and tourism.

With regard to beach width, tourists strongly and significantly favor wider beaches, demonstrating a clear aversion to narrow beaches. Wider beaches yield the most economic value to tourists and significantly contribute to the probability of return. Tourists do not seem to place much value on additional width beyond 8-10 meters. Regarding beach litter, tourists strongly and significantly favor beaches with minimal litter. Cleaner beaches yield more economic value to tourists and contribute the most to the probability of return. Once litter reaches a threshold level (approximately 10 pieces of litter or more per 25 meters of beach), it is likely that tourists will go elsewhere. Finally, it is clear that tourists strongly prefer beachfront lodging, but it appears that they would be equally satisfied with a short walk to a clean beach and beachfront lodging at a marginally dirty beach.

Further research should be directed toward understanding the preferences, perceptions and value to local residents and non-vacation travelers to Barbados. An improved understanding of the sources of beach litter would also seem to be a valuable complement to this work, and would allow cause-and-effect relationships to be detailed so that waste management policy can be improved.

Finally, it is important to note that the data analyzed for this study was collected in 2007, prior to the beginning of the financial crisis. Since then, incomes have diminished and the demand for tourism has declined. Tourists are likely to be more selective in their choice of destination as a result, looking for more value from their travel dollar. The results of this work show that efforts to improve the quality of coastal and marine resources can indeed create that value and strengthen the position of the Barbados tourism product.

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10 APPENDIX

10.1 Appendix 1: Survey Instrument

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INTRODUCTION

This survey is part of a study of the economic value of coastal and marine resources in Barbados including coral reefs, beaches and marine species. The study is being funded through a partnership with the Centre for Resource Management and Environmental Studies at the University of the West Indies, the University of North Carolina Wilmington, the Barbados Ministry of Tourism, the Coastal Zone Management Unit, the Caribbean Tourism Organization and the Barbados Hotel and Tourism Association. Residents and non-residents of Barbados are being surveyed.

The survey is **completely anonymous and confidential**. We do not require your name, address or phone number. Your answers are important for future decisions about coastal and marine management in Barbados, so please be as truthful and complete as possible in answering the questions. Thank you for agreeing to take this survey.

PLEASE TELL US ABOUT YOURSELF AND YOUR CURRENT TRIP TO BARBADOS

1. Where do you live?

United States ə State _____

Canada ə Province_____

United Kingdom ə

Other Europe ə

Caribbean ə Country_____

Other ə

2. What was the main purpose of this visit to Barbados?

Business only	ə	Vacation/Honeymoon	ə	Golf	ə
Visit friends/relatives	ə	Vacation/Business	ə	Conference/meeting	ə
Sports/Games	ə	Other ə … (please specify)_____			

3 Where did you stay in Barbados during this visit?

a. Lodging name_____

b. Lodging type

All Inclusive hotel	ə	Other hotel	ə	Apartment/Villa	ə
Guest house	ə	Friend/relative	ə	Other (specify)_____	ə

c. How many nights did you spend in Barbados on this trip?_____ nights

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4a. Are you a Barbadian National Resident abroad? Yes ə No ə

4b. If no, was this your first visit to Barbados? First visit ə Visited before ə, _____ times before.

4c. Was this your first visit to the Caribbean? First visit ə Visited before ə, _____ times before.

5. Does this trip include visits to other Caribbean islands? No ə Yes ə, please specify islands and nights spent below:____ nights in _____ & ____ nights in _____& ____ nights in _____&____ nights in _____

6a. Not including this trip, how many times did you go on vacation/holiday in the past 12 months? _____

6b. Where did you go on vacation? _____

7. In which age group are you?

Under 20 yearsə 30-39 years ə 50-59 years ə over 69 years ə

20-29 years ə 40-49 years ə 60-69 years ə

8. Are you male or female? ə Male ə Female

9. What is the highest grade you completed in school?

Primary school ə Secondary school ə High school ə

College/University ə Masters or other graduate degree ə

10. Are you married? Yes ə No ə

11. Are you a member of any nature, environmental or conservation organizations? Yes ə No ə

12. What is your approximate **annual household income** before taxes? (Please recall that this survey is completely anonymous)

[US Dollars] ← Tick income in $US ← choose → Tick income in GBP→ [Great Britain Pounds]

UNDER $20,000 ə	$100,000 - $119,999 ə	UNDER £10,000 ə	£50,000 - £59,999 ə
$20,000 - $39,999 ə	$120,000 - $139,999 ə	£10,000 - £19,999 ə	£60,000 - £69,999 ə
$40,000 - $59,999 ə	$140,000 - $159,999 ə	£20,000 - £29,999 ə	£70,000 - £79,999 ə
$60,000 - $79,999 ə	$160,000 - $179,999 ə	£30,000 - £39,999 ə	£80,000 - £89,999 ə
$80,000 - $99,999 ə	$180,000 and ABOVE ə	£40,000 - £49,999 ə	£90,000 and ABOVE ə

13a. With whom did you travel on this trip?

Alone ə Spouse/Partner only ə Other ə

Family ə Group/friends ə (specify)_____

13b. How many adults (18 years or over) are in your travel group? ____ adults

13c. How many children (17 years or younger) are in your travel group? ____ children

14. On which airline did you travel? _____

15. What was the cost (price) per adult round-trip ticket for your air travel? _____ (please specify amount and currency)

16. Approximately how many hours did you spend in transit from your home or point of origin to your lodging in Barbados?_____ hours

17. Did you encounter any unexpected delays during your travel to Barbados? Yes ə No ə

18. What recreation activities did you participate in while in Barbados on this trip? (Tick all that apply):

Use beaches / Sun bathe	ə	Swimming	ə
Boating general power boat	ə	Swimming with turtles	ə
Boating sail boat /catamaran	ə	Snorkeling from boat	ə
Submarine ride	ə	Snorkeling from shore	ə
Glass-bottom boat	ə	Scuba diving	ə
Jet skis	ə	Fishing	ə
Water ski	ə	Eat seafood	ə
Golf	ə	Other (specify)_____	ə

19. What beaches did you visit during this trip to Barbados? (Tick all that apply):

South Coast beaches ə West Coast beaches ə East Coast Beaches ə North Coast beaches ə

20. Did you visit Folkestone Marine Park during this trip? Yes ə No ə

21. Did you visit Carlisle Bay Marine Park during this trip? Yes ə No ə

22a. How much was your total expenditure while in Barbados? _____

(exclude airfare listed in question 14 above) (please specify amount you've spent and currency)

22b. How much of this money did you spend on:

Accommodation (including meals & drinks at hotel)	_____
Other meals and drinks (other than at hotel)	_____
Taxi/car rental/gas/transport	_____
Recreation activities (Water sports, golf)	_____
Other entertainment (nightclubs, places of interest)	_____
Souvenirs	_____
Other shopping	_____
All other spending (including departure tax)	_____

23c. How many persons does this expenditure cover? _____

24. On a scale of 1-5, with 1 meaning "lowest quality" and 5 meaning "highest quality", please rate the following attributes based on this trip to Barbados. If an item does not apply, indicate by circling n/a (not applicable). If you don't know, circle dk (don't know).:

The cleanliness of beaches in Barbados	1 ə	2 ə	3 ə	4 ə	5 ə	n/a ə	dk ə
The quality of the sand on beaches in Barbados	1 ə	2 ə	3 ə	4 ə	5 ə	n/a ə	dk ə
The width of beaches in Barbados	1 ə	2 ə	3 ə	4 ə	5 ə	n/a ə	dk ə
The cleanliness & visibility of seawater in Barbados	1 ə	2 ə	3 ə	4 ə	5 ə	n/a ə	dk ə
The ease of access to the sea in Barbados	1 ə	2 ə	3 ə	4 ə	5 ə	n/a ə	dk ə
The overall quality of beaches on this trip to Barbados	1 ə	2 ə	3 ə	4 ə	5 ə	n/a ə	dk ə

23. Will you return to Barbados? Definitely ə Probably ə Probably not ə Definitely notə

Next, please think about planning a vacation or holiday trip to the Caribbean, and the choice of lodging for that trip. On the following pages you will be offered six choices of two lodging options each with different features. Please read each question carefully. Although they look similar, the two lodging options in each choice differ in at least one way from the other.

Please note the following definitions before reviewing the choices provided below (All scenarios deal with holiday lodging choice in the Caribbean).

- **Price** is the price per night for a standard double room in US Dollars. This price *does not* include any meals or beverages.
- **Type of lodging** describes the type of accommodation. Large hotels have over 75 rooms, small hotels have less than 50 rooms, apartments/apartment hotels and villas are private and offer self-catering amenities, but do not include typical hotel amenities.
- **Width of beach nearest to lodging** is the distance in meters from the high water mark to the vegetation line on the beach nearest to your lodging (1 meter = 1.094 yards = 3.28 feet).
- **Distance from lodging to nearest beach** is the time it takes to walk to the beach nearest to the lodging. If lodging is described as "beachfront" it is less than 1 minute walk. A 12-15 minute walk can be viewed as a 2-3 minute drive.
- **Cleanliness of beach nearest lodging** describes the amount of litter typically encountered per 25 meters of beach length on the beach nearest to lodging.

For **all other important factors** not mentioned here (e.g., availability of meals at lodging, quality of rooms, friendliness and service of staff, etc), please **assume that they are the same** across each option below.

There are no right or wrong answers, only your personal preferences for holiday lodging and your available budget for holiday travel. Please base your choices only on your personal preferences, income, other expenses and time obligations.

Please complete all six of the following choices. Each choice has three options.

Please only select Option C (neither) if both Option A and Option B are unacceptable.

To get a sense of the characteristics listed above, please describe your most recent holiday trip to the Caribbean:

32. In what type of lodging did you stay during this trip?

Small hotel ə Large Hotel ə Apartment/Apartment Hotel ə Villa ə Other ə

33. How close was the lodging to the beach?

Beachfront ə 2-3 minute walk ə 6-8 minute walk ə 12-15 minute walk ə more than 15 minutes walkə

34. What was the approximate price per room per night that you paid for this lodging?

US $0-$75 ə US$76-$150 ə US$151-225 ə US$226-$300 ə greater than US$300 ə

35. Approximately how wide was the beach closest to your lodging?

3-5 meters ə 8-10 meters ə 13-15 meters ə 18-20 meters ə more than 20 meters ə

36. Approximately how much litter did you encounter on the beach nearest your lodging?

0 pieces per 25 meters ə 5 pieces per 25 meters ə 10 pieces per 25 meters ə15 pieces per 25 meters ə

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BLOCK 1

Choice 1: Suppose that you could only choose from the LODGING OPTIONS BELOW (Option A, Option B, or neither option).

If all other factors were equal, which would you prefer?

ATTRIBUTES	**OPTION A**	**OPTION B**	**OPTION C**
Price ($US)	$75	$225	I WOULD NOT CHOOSE EITHER OF THESE OPTIONS
Lodging Type	Small Hotel	Apartment/Apartment Hotel	
Beach Width	3-5 Meters Wide	13-15 Meters Wide	
Distance to Beach	12-15 Minute Walk	6-8 Minute Walk	
Beach Litter	0 Pieces Litter per 25 Meters	10 Pieces Litter per 25 Meters	
I prefer…(check **one** box)	ə **OPTION A**	ə **OPTION B**	ə **NEITHER**

Choice 2: Suppose that you could only choose from the LODGING OPTIONS BELOW (Option A, Option B, or neither option).

If all other factors were equal, which would you prefer?

ATTRIBUTES	**OPTION A**	**OPTION B**	**OPTION C**
Price ($US)	$300	$150	I WOULD NOT
Lodging Type	Apartment/Apartment Hotel	Large Hotel	
Beach Width	8-10 Meters Wide	3-5 Meters Wide	
Distance to Beach	6-8 Minute Walk	Beachfront	

Beach Litter	10 Pieces Litter per 25 Meters	15 Pieces Litter per 25 Meters	CHOOSE EITHER OF THESE OPTIONS
I prefer…(check **<u>one</u>** box)	ə **OPTION A**	ə **OPTION B**	ə **NEITHER**

Choice 3: Suppose that you could only choose from the LODGING OPTIONS BELOW (Option A, Option B, or neither option).

If all other factors were equal, which would you prefer?

ATTRIBUTES	**OPTION A**	**OPTION B**	**OPTION C**
Price ($US)	$150	$75	I WOULD NOT CHOOSE EITHER OF THESE OPTIONS
Lodging Type	Villa	Small Hotel	
Beach Width	8-10 Meters Wide	18-20 Meters Wide	
Distance to Beach	6-8 Minute Walk	2-3 Minute Walk	
Beach Litter	5 Pieces Litter per 25 Meters	15 Pieces Litter per 25 Meters	
I prefer…(check **<u>one</u>** box)	ə **OPTION A**	ə **OPTION B**	ə **NEITHER**

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Choice 4: Suppose that you could only choose from the LODGING OPTIONS BELOW (Option A, Option B, or neither option).

If all other factors were equal, which would you prefer?

ATTRIBUTES	**OPTION A**	**OPTION B**	**OPTION C**
Price ($US)	$300	$225	I WOULD NOT CHOOSE EITHER OF THESE OPTIONS
Lodging Type	Small Hotel	Villa	
Beach Width	13-15 Meters Wide	18-20 Meters Wide	
Distance to Beach	2-3 Minute Walk	12-15 Minute Walk	
Beach Litter	10 Pieces Litter per 25 Meters	0 Pieces Litter per 25 Meters	
I prefer…(check **one** box)	ə **OPTION A**	ə **OPTION B**	ə **NEITHER**

Choice 5: Suppose that you could only choose from the LODGING OPTIONS BELOW (Option A, Option B, or neither option).

If all other factors were equal, which would you prefer?

ATTRIBUTES	**OPTION A**	**OPTION B**	**OPTION C**
Price ($US)	$225	$300	I WOULD NOT CHOOSE EITHER
Lodging Type	Large Hotel	Villa	
Beach Width	18-20 Meters Wide	3-5 Meters Wide	
Distance to Beach	12-15 Minute Walk	Beachfront	
Beach Litter	15 Pieces Litter per 25 Meters	5 Pieces Litter per 25 Meters	

			OF THESE OPTIONS
I prefer…(check **one** box)	ə **OPTION A**	ə **OPTION B**	ə **NEITHER**

Choice 6: Suppose that you could only choose from the LODGING OPTIONS BELOW (Option A, Option B, or neither option).

If all other factors were equal, which would you prefer?

ATTRIBUTES	**OPTION A**	**OPTION B**	**OPTION C**
Price ($US)	$75	$150	I WOULD NOT CHOOSE EITHER OF THESE OPTIONS
Lodging Type	Apartment/Apartment Hotel	Small Hotel	
Beach Width	18-20 Meters Wide	8-10 Meters Wide	
Distance to Beach	2-3 Minute Walk	Beachfront	
Beach Litter	10 Pieces Litter per 25 Meters	0 Pieces Litter per 25 Meters	
I prefer…(check **one** box)	ə **OPTION A**	ə **OPTION B**	ə **NEITHER**