The Economic Importance of Coastal and Marine Resources to Tourism in Barbados









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Contents

LIST OF ABBREVIATIONS

CB	Contingent behaviour
CE	Choice experiment
CS	Consumer surplus
CTO	Caribbean Tourism Organization
CVM	Contingent valuation method
GDP	Gross domestic product
UNCW	The University of North Carolina Wilmington
WRI	World Resources Institute
WTA	Willingness to accept
WTP	Willingness to pay
WTTC	World Travel & Tourism Council

EXECUTIVE SUMMARY

Barbados is experiencing extreme degradation of its coastal and marine resources due to local factors (e.g., overfishing, coastal overdevelopment, siltation and pollution) and climate-related factors, which threaten the viability of the country's tourism product as well as its economic growth prospects. It is acknowledged that tourists have strong preferences for high-quality beaches, clear water and healthy coral reefs and sea turtles. However, research gaps remain regarding the tourism consequences of coastal and marine resource deterioration and how funds can be generated to support conservation efforts. This study attempts to fill those gaps.

The report summarizes the results of an empirical study regarding visitor preferences, activities in the coastal zone and visitors' willingness to pay a conservation fee to manage coastal and marine resources in Barbados. This information can be used to identify and develop financing mechanisms for sustainable tourism development and allocate budgetary resources to outcomes that provide the highest return on investment.

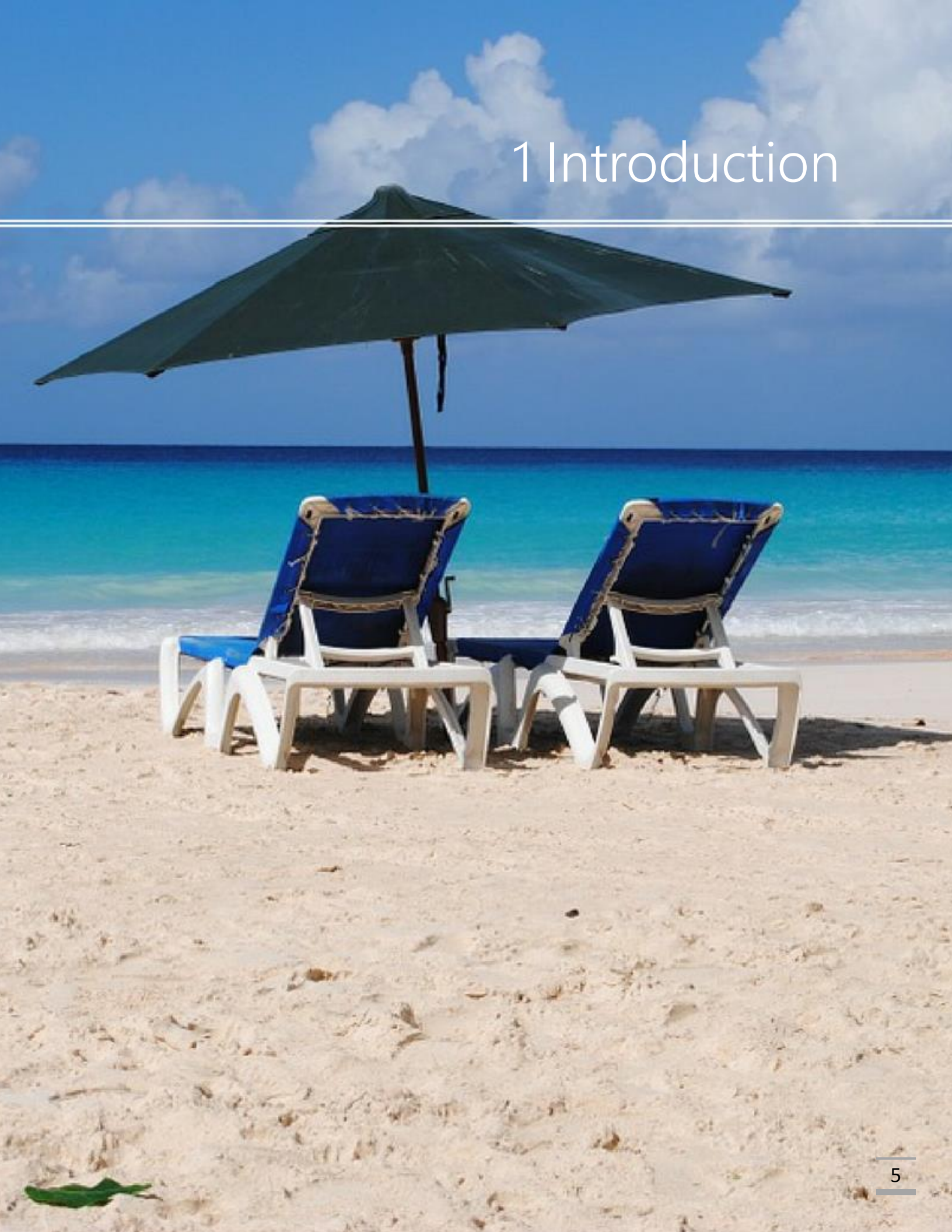
A questionnaire was designed to measure visitors' activities, spending, ratings of coastal and marine attributes in Barbados and potential responses to changes in environmental conditions. It was administered to over 3,000 visitors in 2015. Respondents were asked whether they were willing to pay an environmental fee "to help fund the long-term management of coastal and marine resources in Barbados." They were also presented with a choice experiment (CE) designed to understand respondent preferences and willingness to pay for changes in four coastal and marine attributes: beach width, water quality, diving/snorkelling quality and storm risk.

Results show that visitors are heavily involved in recreational activities in the coastal zone and perceive the current coastal and marine environment to be of high quality. About half of all visitors view underwater marine life during their time in Barbados, indicating the importance of preserving marine life. A majority of visitors were willing to pay a fee to help fund the long-term protection of coastal and marine resources in Barbados. More precisely, approximately 80 percent of visitors were willing to pay an environmental fee of US$5 per trip. Their most preferred avenues for payment of the fee were a governmental organization involved with coastal/marine resource management and a marine park fund dedicated to the conservation of specific natural resources. Those not willing to pay the fee cited the reason that natural resource management was not their responsibility. Only 5 percent of visitors not willing to pay stated that they would not return to Barbados if such a fee were imposed.

Findings suggest that visitors are willing to pay significantly more for higher sea-water quality, lower storm risk, better coral reef and marine life and wider beaches. Conversely, if the quality of coastal and marine resources in Barbados were to worsen, a significant proportion of respondents who initially stated their interest in returning switched to “would not return.”

Of the coastal and marine attributes examined, sea-water quality has the highest impact on return visitation. Moreover, visitors are more sensitive to environmental degradation than to improvements. Small losses in beach width, coral health, marine life and sea-water quality are likely to adversely affect return visitation, but small improvements in these aspects of environmental quality may have only a minimal positive impact on visitation. Clearly, continued degradations of coastal and marine resources in Barbados are likely to have a significant negative impact on return visitation rates and market share, which is detrimental to the country’s growth prospects.

1 Introduction



1.1 The importance of tourism in Barbados

Tourism is the backbone of many small nations. Indeed, the top 10 tourism-dependent nations, ranked according to the direct contribution of travel and tourism to GDP, are all small islands (World Travel and Tourism Council [WTTC], 2016). Thus, Caribbean countries—and in particular Barbados—understand that increasing their national tourism contributions allows their economies to grow and gain a larger share of the global economy (Archer, 1985). Barbados transformed itself from a low-income agricultural economy primarily producing sugar into a high-income economy driven mainly by tourism and international financial services. Barbados' tourism economic impact ranks 15th out of 184 countries (WTTC, 2014). Bolstered by 591,872 stay-over arrivals and 586,615 cruise ship passengers in 2015, Barbados' tourism sector, as estimated by the WTTC, directly contributed to 12 percent of GDP (US$0.5 billion) and, including indirect effects, contributed 39.5 percent (US$1.7 billion) of total economic activity (WTTC, 2016). Barbados also ranked 17th worldwide and 9th in the Caribbean (Knoema, 2015) regarding the proportion of employment generated from tourism. The sector directly and indirectly generates approximately 39 percent of the national employment.

Current global economic trends indicate that service sectors have the largest potential for growth in areas of international financial services, tourism, information technology, education, health and cultural services (U.S. Department of State, 2015). Similarly, in Barbados, tourism is the sector with the largest foreign direct investment (Economic Commission for Latin America and the Caribbean [ECLAC], 2015), accounting for US$63 million in 2014 and US$67 million in 2015 (Central Bank of Barbados, 2016).

The Guardian and CNN consistently rate Barbados' beaches as some of the best in the world. It is one of the few unique countries offering a wide range of famous beaches and opportunities for almost all coastal and marine recreation activities. Beaches—the essence of "sun, sand, and sea" tourism—remain the foundation of a quality tourism product in Barbados (Dharmaratne and Brathwaite, 1998), so it is not surprising that the coastal zones of the island are the location of 95 percent of tourism sites (Inter-American Development Bank [IDB], 2013) and more than 70 percent of hotels (Cashman et al., 2012).

1.1.1 Threats to coastal and marine resource quality are threats to the economy

Despite their importance to the economy of Barbados, coastal and marine resources are under intense pressure from local and climate-related factors (Government of Barbados, 2010). Local factors such as overfishing, coastal overdevelopment, siltation and pollution from sewage and runoff threaten to diminish the quality of coastal resources, jeopardizing the economic viability of the tourism product. Climate change problems are manifested through land loss, beach erosion and damage to reefs (Cashman et al., 2012).

Though historical changes in the quality of coastal and marine resources are difficult to measure, there is a preponderance of evidence that many aspects of marine quality are declining over time. For example, it is widely understood that beaches in Barbados are dynamic, with the volume of sand changing over time. Yet evidence from the Coastal Zone Management Unit in Barbados suggests that most beaches on the south and west coasts of the island are eroding over time, with beach widths diminishing at an average rate of 15 metres per 100 years, or approximately 15 centimetres per year (Government of Barbados, 2010). Coral reef quality in the Caribbean has been steadily declining over time (e.g., Alvarez-Filip et al., 2009) with estimates ranging from 50 percent to 80 percent losses in coral cover since the early 1970s (Jackson et al., 2014). At this rate, live coral cover may be completely lost in less than 30 years. Moreover, evidence from Barbados suggests a declining trend in the percentage of live coral cover since the 1970s (Jackson et al., 2014), with the exception of a slight increase in coral cover from 1990–2000. Coupled with the degradation of coral reef habitats is the loss of fish biomass and diversity. Estimates of reef fish declines in the Caribbean range from 2.7 to 6.0 percent losses per year (Paddack et al., 2009).

These changes in coastal and marine quality should be viewed as direct threats to the viability of the tourism product and the economy of Barbados. Tourists in Barbados have strong preferences for high-quality beaches, clear water and the presence of sea turtles and healthy coral reefs. In a study by Uyarra et al. (2005), most respondents (80 percent) indicated that they would be unwilling to return to Barbados for the same price if the size of beaches diminished. Tourists were even willing to pay an environmental (conservation) levy for improved sewage treatment that would improve water quality in the Folkestone Marine Reserve. A similar willingness was displayed in a study by Schuhmann et al. (2013), which showed that scuba divers were willing to pay higher prices for encounters with marine

turtles and higher levels of coral cover and fish diversity. Schuhmann (2011) showed that tourists' perceptions of coastal quality and the probability of return visitation are highly dependent upon the amount of litter viewed on beaches. Not surprisingly, they are willing to pay considerably higher prices for lodging options near wider beaches and beaches with minimal litter (Schuhmann et al., 2016). It is important to note that these preferences are not limited to divers; roughly half of all tourists can be expected to directly view the underwater marine environment during their stay in Barbados (Schuhmann, 2012).

The provision of a high-quality tourism product centred on coastal and marine quality requires commercial infrastructure and opportunities for recreation in the coastal zone. Yet development and human densities in the coastal zone are detrimental to coastal and marine ecosystems (Jackson et al., 2014). Unless environmental protections are comprehensive and effectively enforced, the economic sustainability of the tourism product is uncertain. While the studies referenced above demonstrate the high dependency of Barbados on the quality of coastal and marine resources and provide estimates of marine quality degradation, a great deal remains unknown.

The development of efficient, cost-effective natural resource management policies pertaining to tourism requires improved understanding of how tourism revenue and visitation in Barbados may be affected by the degradation of coastal and marine resources. Further, an improved understanding of visitor preferences, activities in the coastal zone and willingness to pay for coastal and marine characteristics can be useful in identifying and developing financing mechanisms for sustainable tourism development and allocating scarce budgetary resources to outcomes that provide the highest return on investment (Waite et al., 2014; 2015). While we do not make specific policy recommendations, this study attempts to provide the information necessary to highlight the economic importance of investing in coastal and marine protection.

1.1.2 A collaborative partnership for advancing the development of sustainable tourism in the Caribbean region

To improve the state of knowledge regarding the economic importance of coastal and marine assets in the Caribbean, a collaborative partnership was formed between the Caribbean Tourism Organization (CTO), the World Resources Institute (WRI) and the University of North Carolina Wilmington (UNCW). Each partner contributed financial and/or in-kind resources. The

partnership's overarching goal was to provide tourism policymakers and other tourism stakeholders with the information necessary to assess the potential net effect (benefit/cost) of a public or private policy intervention that preserves and more efficiently manages coastal resources, thereby promoting sustainable tourism development. Consequently, it is vital to quantify the effect of changes in quality of the coastal and marine environment on tourists' behaviour in order to understand the potential net benefits of policy interventions. Starting with a pilot study in Barbados, specific objectives aligned with this goal were formulated. The objectives included identifying tourism and environment challenges and formulating associated research questions that were addressed through:

- desk reviews and consultations with coastal and marine stakeholders,
- the development of a visitor exit questionnaire to determine preferences and willingness to pay for changes in coastal and marine quality and
- empirical analysis of exit questionnaire data to predict how tourism may be impacted by changing environmental conditions.

In line with best practices for decision-relevant ecosystem valuation (Waite et al., 2014; 2015), the authors consulted a wide range of coastal, tourism and marine stakeholders in Barbados in early 2015. These consultations generated a list of research questions targeted at improved understanding of the value of coastal and marine resources that are pertinent to the Barbados tourism product and how changes in resource quality might impact visitation. Four primary research questions emerged through consultations:

R1. What will happen to tourism revenue or visitation in Barbados following degradation of coastal and marine resources (e.g., beaches, coral reefs, marine life and sea-water quality)?

R2. Are tourists willing to pay an environmental fee to fund conservation and management of coastal and marine resources in Barbados? If so, how much are tourists willing to pay?

R3. How much are visitors willing to pay (willing to accept) for improvements (degradations) in various aspects of coastal and marine quality?

R4. What is the relative value of different aspects of coastal and marine quality? That is, are certain attributes of coastal and marine quality more important to visitors than others?

The next section describes the research study designed to address these questions. The paper concludes with a summary of results and implications for coastal and marine resource policy in Barbados.

2 Study Methods

2.1 Questionnaire development

Based on prior work by Schuhmann (2012), a draft exit questionnaire was developed to measure visitors' activities, spending, ratings of coastal and marine attributes in Barbados and potential responses to changes in environmental conditions. The questionnaire was modified after discussions with numerous coastal, tourism and marine stakeholders, including representatives from the Barbados Coastal Zone Management Unit (CZMU), the Barbados Environment Protection Division (EPD), the Caribbean Tourism Organization (CTO), CARIBSAVE, the Centre for Resource Management and Environmental Studies at the University of the West Indies–Cave Hill (CERMES), and the Inter-American Development Bank (IDB). The questionnaire was pretested by the authors and CTO enumerators in February 2015 and modified for clarity and simplicity.

In addition to providing an array of demographic information and trip characteristics, visitors were asked questions designed to obtain insight into their perceptions of coastal and marine attributes. These attributes included the cleanliness of beaches, the ease of getting in and out of the sea, the natural character of beaches, the quality of the sand on beaches, the width of beaches, the cleanliness and visibility of the sea-water, the ease of access to the beaches, the quality of coral reefs and marine life and the quality of the Folkestone and Carlisle Bay Marine Parks.

The questionnaire also asked respondents whether hypothetical changes in environmental quality would affect their decision to return to Barbados. These contingent behaviour scenarios included changes to beach width, coral reef health, the quality of marine life (turtles, fish, etc.) and the cleanliness of sea-water.

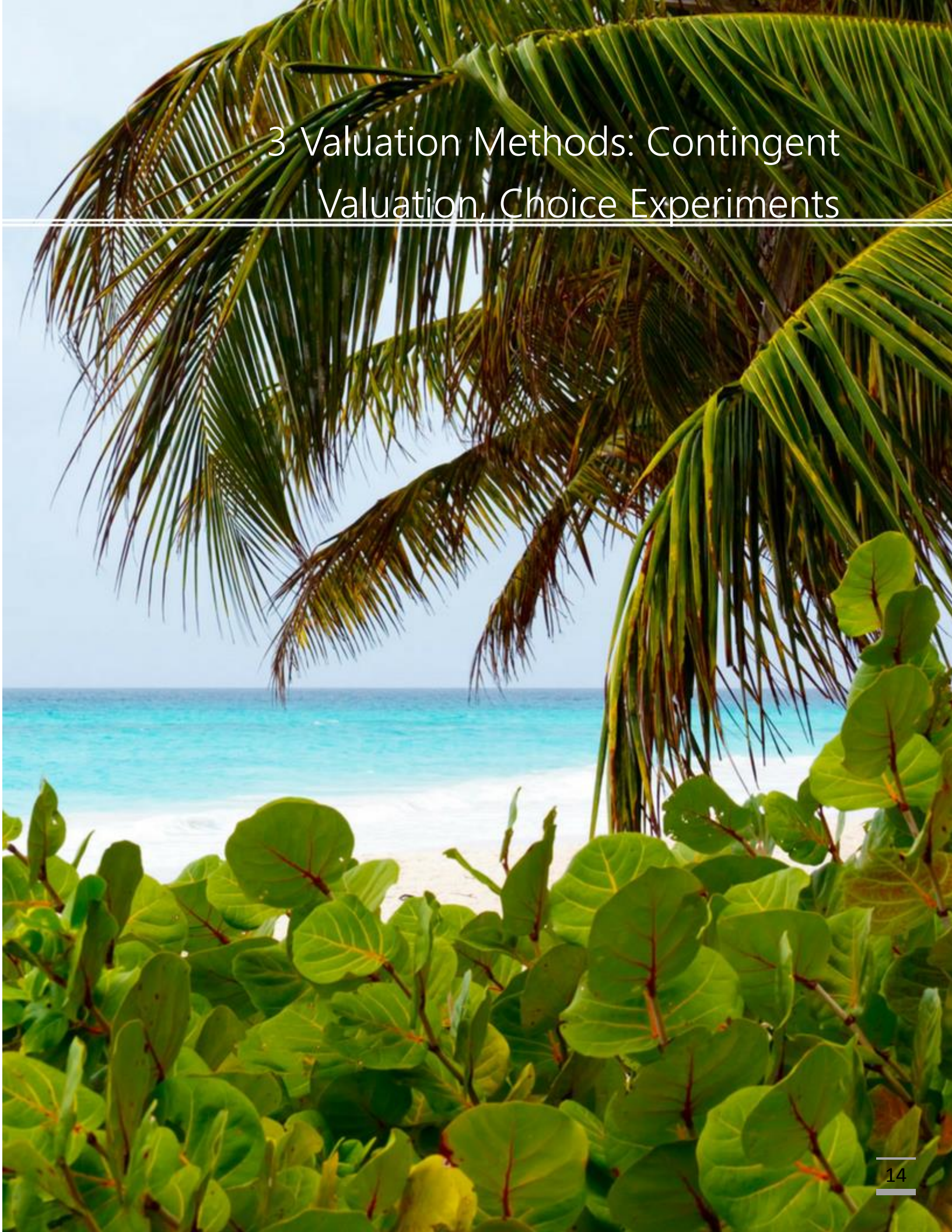
Respondents were also asked whether they were willing to pay an environmental fee "to help fund the long-term management of coastal and marine resources in Barbados." A choice experiment (CE) was designed to infer factors associated with respondent preferences and willingness to pay for changes in four coastal and marine attributes: beach width, water quality, diving/snorkelling quality and storm risk.

The questionnaire was available both as hard copy (print) and in online formats. Due to print space limitations, this report discusses only results from the print format. However, we note that data collected from online respondents are qualitatively similar to data provided by respondents who completed the printed questionnaire.

2.2 Questionnaire implementation

The print format questionnaire was administered to visitors in the departures lounge of the Grantley Adams International Airport in the final two weeks of March 2015. Questionnaires were distributed to more than 4,000 visitors. 3,568 completed questionnaires containing information on aspects of coastal and marine quality were retained for analysis.

3 Valuation Methods: Contingent Valuation, Choice Experiments



3 Valuation methods: contingent valuation, choice experiments

3.1 Non-market valuation

Economic valuation allows us to measure net benefits of policy interventions, which serve as a basis of improved decision-making that makes resource allocation more efficient. Further, the economic valuation of "non-market" or public goods and services such as those provided by the natural environment requires an understanding of how those goods and services affect human well-being. Valuation also provides a means of measuring how much individuals are willing to pay (WTP) for beneficial changes in the natural environment or willing to accept (WTA) as compensation for unfavourable changes (Bockstael et al., 2000; Barbier et al., 2011). Thus, economic valuation allows a comparison of two alternative states of the world (i.e., an initial/current state and a final state that could be an improvement due to a policy intervention).

There are a variety of ways that humans interact with and gain benefits from the natural environment, and as such there are a range of approaches to valuation. Choice of valuation method depends on the nature of the good or service being valued and the intended purpose of the value estimates. Some values, such as those associated with direct extractive uses of environmental goods (e.g., capture fisheries) are revealed through market transactions, which provide a straightforward means of monetization. When benefits occur outside of markets or are not easily ascribed to specific uses, non-market valuation techniques must be employed.

Non-market valuation methods used in this study include the contingent valuation method (CVM) and choice experiments (CE). These methods estimate changes in values of quality or quantity of public goods or services not associated with direct use or which have not yet transpired.[1] For example, a projected change in environmental conditions may lead to changes in value that cannot be estimated via direct observation. To understand such values, we must attempt to elicit them from the relevant group of people using carefully crafted questions. CVM relies on direct questions regarding WTP or WTA for a particular change in a good or service, while CEs ask people to make choices between goods or services that are described in terms of various attributes. In addition to asking questions regarding respondents' willingness to make hypothetical payments, survey respondents can answer questions regarding how they would behave under hypothetical future conditions. Data collected from such contingent behaviour (CB)

[1] While much less known outside of the economics profession, both of these techniques are well-established in the literature, are endorsed by a host of national governments and have been employed around the world, including numerous applications in the Caribbean.

questions can be used to predict how respondents would react to changes that lie outside the scope of historical conditions.

3.2 Contingent valuation method and contingent behaviour scenarios

Consultation with coastal and marine stakeholders in Barbados generated a list of research questions targeted at achieving a better understanding of the value of coastal and marine resources that are pertinent to the Barbados tourism product and how changes in resource quality might impact visitation. Research questions R1 (effect of environmental change on visitation) and R2 (willingness to pay to fund conservation) were amenable to analysis via the contingent valuation method (CVM) and contingent behaviour (CB) approaches. Toward an understanding of R1, respondents were queried about the likelihood that they would return to Barbados under hypothetical scenarios of environmental change. The survey presented tourists with percentage changes in attributes of interest to stakeholders, including beach width, coral reef health, the quality of marine life (e.g., turtles, fish) and the cleanliness of sea-water, assuming that all other conditions remained the same.

To understand visitors' willingness to pay fees targeted for conservation, the questionnaire also probed respondents about their willingness to pay an environmental fee "to help fund the long-term management of coastal and marine resources in Barbados." Respondents were given different values for the fee, ranging from US$1 to US$75. Those who indicated that they were willing to pay the designated fee were further prompted for their preferred way to pay and were presented with a list of payment options. Visitors not willing to pay the fee were asked to provide the underlying primary reason.

CB and CVM data can be analysed using a variety of statistical approaches, ranging from the calculation of descriptive statistics to modelling response via regression analysis. The latter allows for the estimation of the influence that various factors have on respondent willingness to return to Barbados or willingness to pay the fee.

3.3 The choice experiment

A choice experiment (CE) was designed to address research questions R3 (willingness to pay for changes in coastal and marine quality) and R4 (relative importance of environmental attributes) and also to provide validation for R1 (effect of environmental change on visitation). Beach width, coral reef health, sea-water quality, and storm risk were identified as priority attributes for

the CE due to their importance to coastal and marine stakeholders in Barbados, importance to tourism and susceptibility to local and climate-related stressors. To facilitate monetary valuation, price was also selected as an attribute. Levels for the attributes were identified using data from the Coastal Zone Management Unit and in consultation with other stakeholders and the published literature. Levels were then selected to allow inference of the value of both improved and degraded conditions relative to the current state.

While the public can easily comprehend beach width and trip price through simple verbal and numerical descriptions (i.e., observable width in meters, price for air and lodging in dollars), sea-water quality, storm risk and coral reef health may not be as easily understood or appreciated. Hence, tactical questions were employed. Since sea-water quality is usually associated with the risk of gastrointestinal illness (e.g., Georgiou and Langford, 2002; World Health Organization [WHO], 2001), we used the probability of a stomach infection to depict this attribute to respondents. In line with published literature (Beharry-Borg and Scarpa, 2010; Forster et al., 2012), storm risk is described as the number of days that might be interrupted due to extreme weather conditions. Coral reef health is commonly related to survey respondents through images depicting corals and other marine life (e.g., Schuhmann et al., 2013; Gill et al., 2015) and is germane to respondents who engage in underwater recreation. A full list of attributes is presented in Table 1.

Table 1: Destination choice attributes

Attributes
Price for airfare and one week's lodging (US$)
Beach width (metres)
Sea-water quality (% chance of an infection from swimming/bathing)
Storm risk (days out of 100 interrupted by hurricane or tropical storm)
Coral reef quality (images)

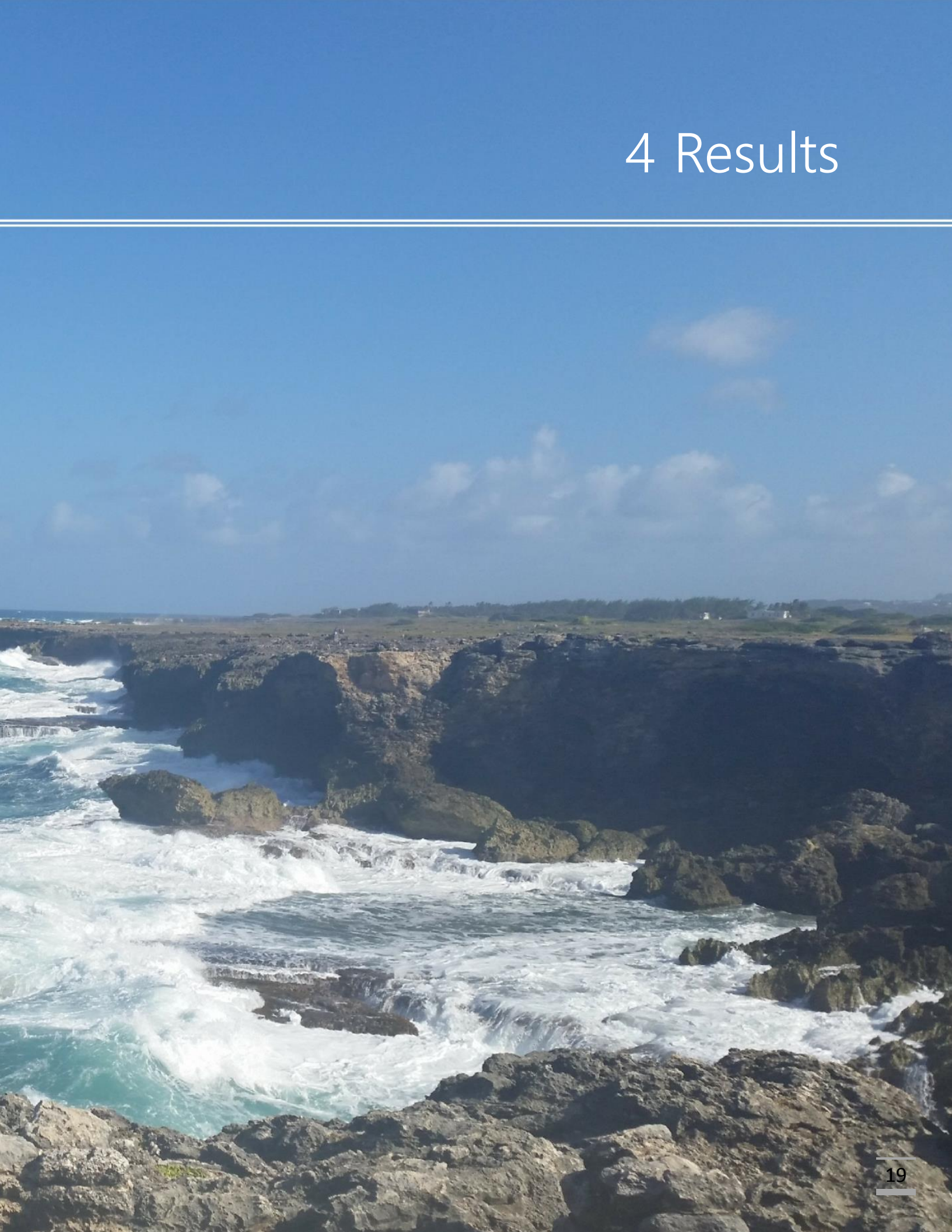
Each respondent faced four scenarios depicting the choice between two alternative trips and/or "neither trip." Figure 1 shows an example of a single paired choice.

Figure 1: Example of a single paired choice for CE

Choice 1: Suppose that you could only choose from the CARIBBEAN HOLIDAY DESTINATION OPTIONS BELOW (Option A, Option B, or neither option). If all other factors were equal, which would you prefer?

Features	Option A	Option B	Option C
Travel price per person (air & lodging)	US$4,000	US$1,500	I WOULD NOT CHOOSE EITHER OF THESE OPTIONS
Beach width	6–10 metres wide	18–20 metres wide	
Sea-water quality	Poor water quality (> 10% chance of an infection)	Moderate water quality (5–10% chance of an infection)	
Diving/snorkelling quality	Excellent (Image D)	Low (Image A)	
Storm risk	Virtually no storm risk (< 1 day out of 100 interrupted)	Moderate storm risk (5 days out of 100 interrupted)	
I PREFER… (check <u>one</u> box)→	☐ OPTION A	☐ OPTION B	☐ NEITHER

4 Results



4.1 Sample weighting, demographic profile and trip characteristics

Approximately 34 percent of the respondents were each from the UK and the US, with 18 percent from Canada, 8 percent from the Caribbean and 3 percent from Europe. Relative to the actual shares of visitors from these main markets to Barbados in 2015 (approximately 35 percent, 23 percent, 13 percent, 16 percent and 8 percent, respectively [Barbados Statistical Service, 2016]) residents from the US and Canada were therefore overrepresented in our sample and residents from the Caribbean and Europe underrepresented. To accurately represent the Barbados visitor profile with respect to country of origin, the data were corrected using historical main-market shares as sampling weights. The analysis below pertains the corrected sample data (henceforth "the sample") except where noted otherwise.

Approximately 60 percent of the sample were married. Our sample included slightly more females (53 percent) than males. The average age of tourists was 47 years. Tourists generally had a high level of education, with approximately 68 percent having completed some college education and roughly 32 percent having completed a graduate degree. Household incomes were correspondingly high, with an average of nearly US$90,000. The average length of stay was 10 days. Travel group size ranged from 1 to 61, with an average of 2.4 adults and 0.4 children. Visitors spent more than US$1,400 per person while in Barbados on lodging, transport, food, drink and recreation. Sample statistics for demographic variables and trip characteristics are shown in Table 2.

Table 2: Demographic and trip characteristics of visitor sample

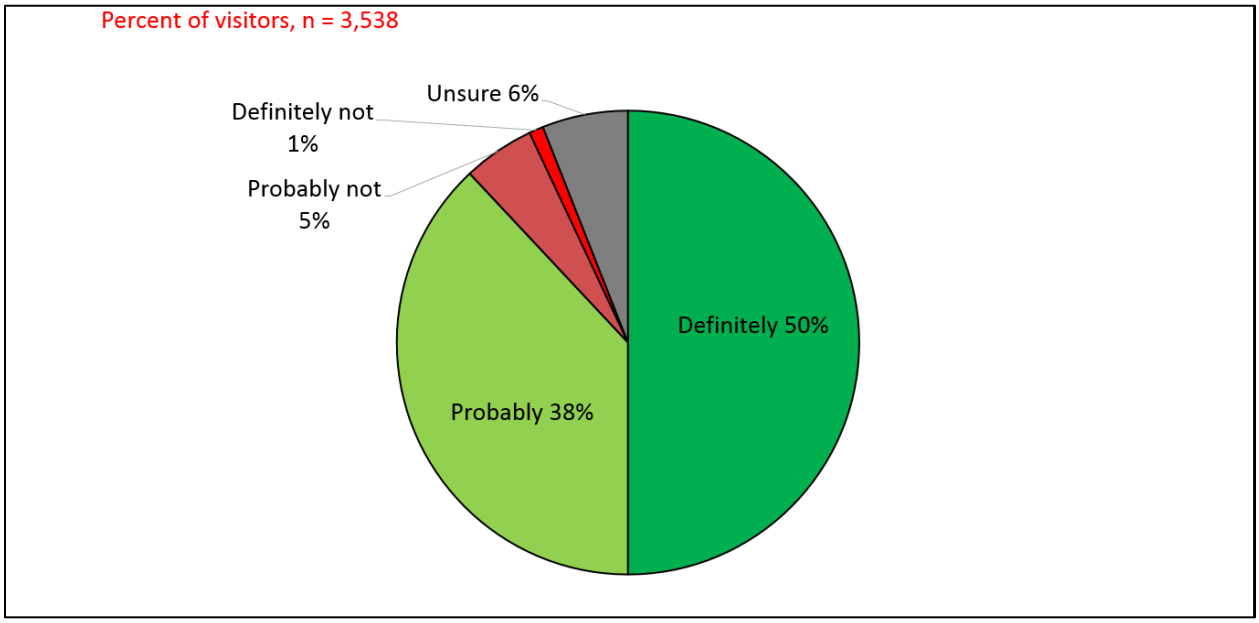
Variable	Number of Respondents	Mean	Median
First visit to Barbados	3,508	48%	
First visit to the Caribbean	3,275	23%	
Visits to Barbados	1,654	7.95	2.91
Visits to the Caribbean	2,275	9.09	4.22
Age	3,507	46.33	44.70
Male	3,480	47%	
Married	3,509	60%	
Household income (US$)	2,682	89,107	75,936
High school education	3,406	19%	
Associate's degree	3,406	8%	
Bachelor's degree	3,406	28%	
Graduate degree	3,406	32%	
Adults in travel party	3,317	2.37	1.42
Children in travel party	2,865	0.36	0
Nights in Barbados	3,520	10.25	6.69
Total spending while in Barbados (per person, USD)	1,345	1,430	981
Spending on accommodation (per person, USD)	1,312	941	600
Spending on meals/drinks outside of lodging (per person, USD)	1,315	343	200
Spending on transport in Barbados (per person, USD)	1,271	140	75
Spending on coastal and marine recreation (per person, USD)	869	145	75
Price for airfare and lodging per week (per person, USD)	2,166	1,669	1,206

4.2 Visitors' stated plans to return to Barbados in the future

Approximately half (48 percent) of the respondents were on their first trip to Barbados, and a quarter (23 percent) were on their first trip to the Caribbean as a whole. Of those who had travelled to Barbados on a previous occasion, the average and median number of prior trips

were approximately 8 and 3 respectively, indicating large values reported by some respondents. When questioned about their probability of returning to Barbados, 88 percent stated that they would definitely or probably return, while only 5.6 percent indicated that they would probably not or definitely not return. Approximately 6 percent of respondents were unsure. Figure 2 shows stated probability of return for visitors.

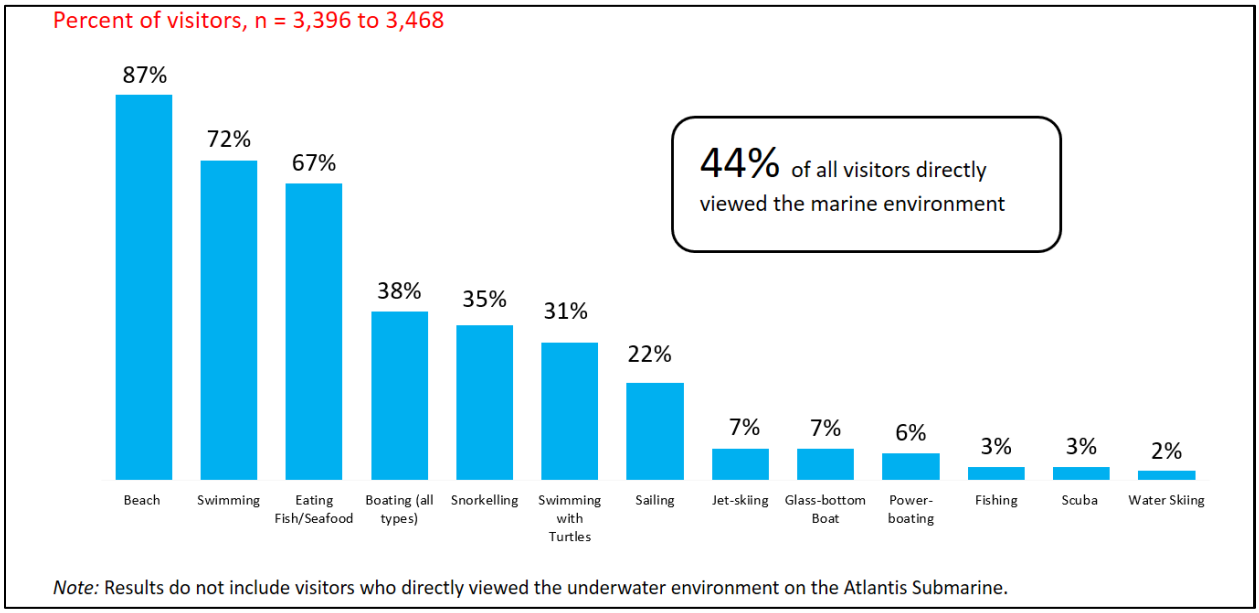
Figure 2: Stated probability of return to Barbados



4.3 Participation of visitors in coastal/marine activities

Visitors to Barbados reported being heavily involved in coastal and marine recreation (Figure 3). The majority (87 percent) reported visiting the beach, and 72 percent reported swimming. Visitors who engaged in these two activities did so nearly every day. Snorkelling was an attractive activity, with 35 percent of visitors reporting snorkelling either from a boat (29 percent) or from shore (18 percent). More than 39 percent of respondents participated in some form of boating, including sailing (25 percent), glass-bottom boating (7 percent) and powerboating (6 percent). Nearly half of all visitors reported viewing the underwater marine environment through snorkelling or diving or via glass-bottom boat.

Figure 3: Visitor participation in coastal and marine recreation activities



4.4 Visitors' ratings and perceptions of current coastal/marine quality

Table 3 shows that the quality of the coastal and marine environment was generally well-regarded by respondents, with average ratings above 4 on a 5-point scale for all attributes except beach width and coral reef quality (at 3.96 and 3.97 respectively). However, first-time visitors to Barbados rated most aspects of the coastal and marine environment higher than repeat visitors. Exceptions include the width of beaches, the ease of access to beaches and the quality of reefs, each of which were rated equally by first-time and repeat visitors.

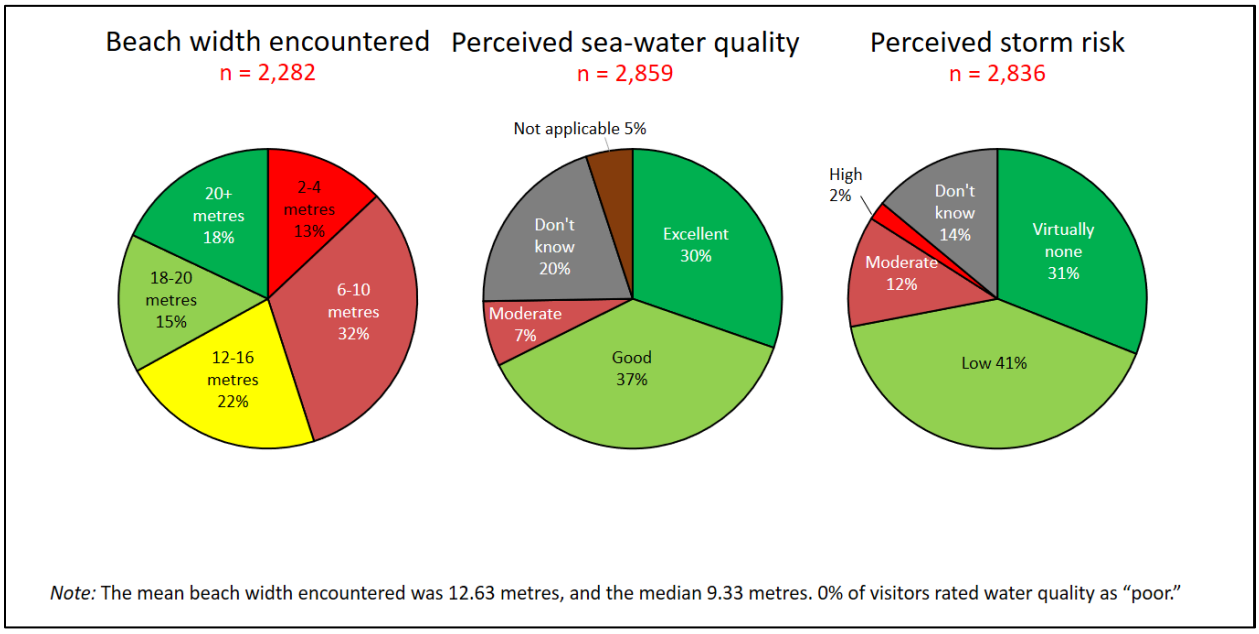
Regarding perceptions of risk for a stomach infection from swimming in the sea, most respondents perceived the risk of a stomach infection from swimming as either "minimal risk" (37 percent) or "virtually no risk" (30 percent). About 20 percent of the sample was not aware of the risk of contamination/contacting a stomach infection from swimming. Surprisingly, a majority of respondents perceived the risk of a hurricane or tropical storm interrupting their trip as either "no risk" (31 percent) or "low risk" (41 percent). Approximately 14 percent did not know about the risk of a hurricane or tropical storm. A majority of visitors reported encountering beaches between 6 and 16 metres wide. Relatively few visitors reported encountering very narrow beaches (13 percent) or very wide beaches (17 percent). The average beach width reported by respondents was 12.6 metres, with a median of 9.3 metres. Figure

4 shows average beach width encountered and perceptions of sea-water quality and storm risk for the full sample.

Table 3: Visitors' ratings of current coastal and marine quality (1–5)

Characteristic	Number of Respondents	Average Rating	Median Rating
Quality of sand	3,400	4.37	4.10
Cleanliness/visibility of sea-water	3,347	4.32	4.09
Ease of beach access	3,326	4.30	4.08
Natural character of beaches	3,300	4.28	3.98
Ease of getting in/out of the sea	3,142	4.19	3.94
Cleanliness of beaches	3,422	4.16	3.85
Quality of reefs	1,973	3.97	3.60
Width of beaches	3,313	3.96	3.60
Quality of Carlisle Bay Marine Park	683	4.18	3.92
Quality of Folkestone Marine Park	618	4.04	3.75

Figure 4: Visitors' descriptions of current coastal and marine quality



Note: The mean beach width encountered was 12.63 metres, and the median 9.33 metres. 0% of visitors rated water quality as "poor."

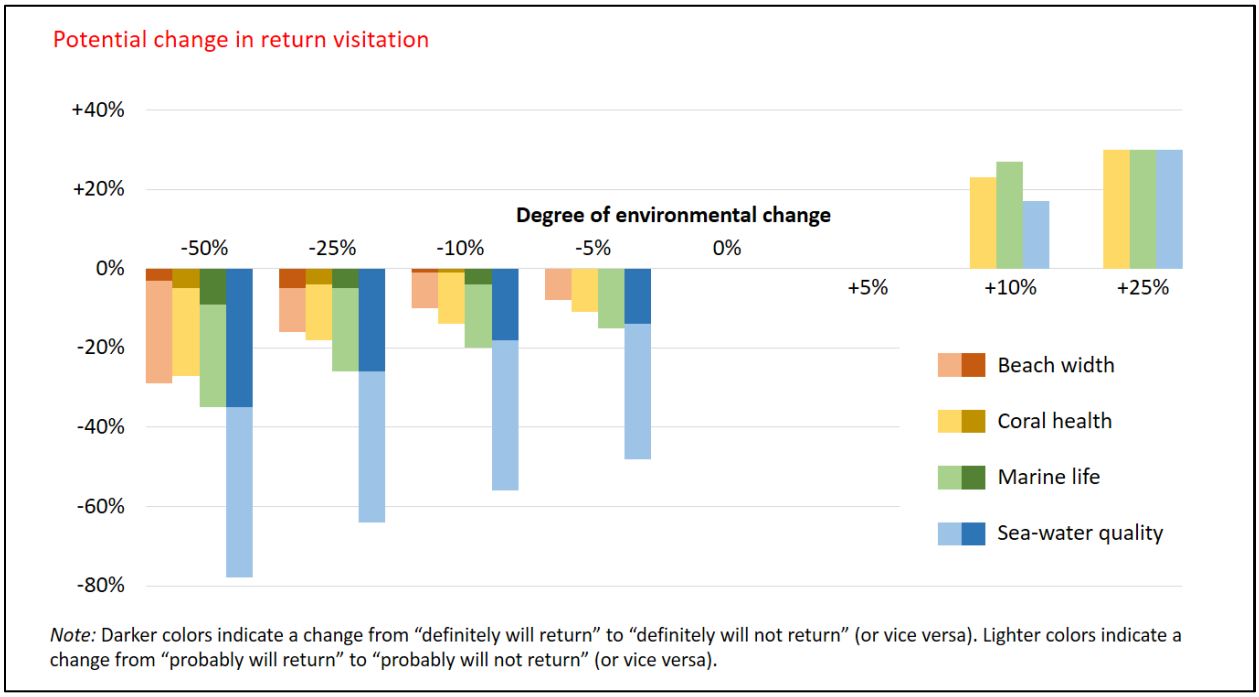
4.5 How do visitors' plans to return to Barbados change under scenarios of environmental change?

Of the 2,300 respondents to the environmental change questions, nearly 90 percent unconditionally stated that they would likely or definitely return to Barbados. However, after being presented with scenarios depicting degraded environmental conditions of 5 percent, their intentions changed. More than 10 percent of those who initially stated they would return stated that they would probably not or definitely not return to Barbados under scenarios of reduced beach widths or coral health. If the quality of marine life were to worsen by a mere 5 percent, approximately 15 percent of respondents would probably not or definitely not return to Barbados. An astounding 48 percent would probably not or definitely not return to Barbados if the quality of sea-water were to decrease by 5 percent. Notably, first-time visitors appear to be more sensitive to degradations to environmental conditions than return visitors.

An overwhelming majority (between 80 and 82 percent) of respondents stated that they would probably return or definitely return to Barbados when faced with scenarios of improved coastal and marine

conditions (ranging from 5 to 25 percent).[2] Between 13 and 29 percent of respondents who initially stated that they would not return or did not know if they would return stated that they definitely or probably would return under scenarios involving improved coastal and marine conditions (see Figure 5). Improvements of 5 percent did not induce significant changes in respondents' stated probability of return.

Figure 5: Percentage of respondents who changed their stated probability of return (from positive to negative or vice versa) in response to scenarios of environmental change



Note: Darker colors indicate a change from "definitely will return" to "definitely will not return" (or vice versa). Lighter colors indicate a change from "probably will return" to "probably will not return" (or vice versa).

4.6 Visitors' willingness to pay an environmental fee

A majority of visitors (more than 68 percent) were willing to pay an environmental fee of US$25 or less, and roughly 80 percent of visitors were willing to pay an environmental fee of US$1 or US$5. The most preferred avenues for payment of the fee were to a governmental organization involved with coastal/marine resource management and to a marine park fund dedicated to the conservation of specific natural resources (see Figures 6 and 7 for details).

[2] It is notable that these values are lower than the percentage of respondents who initially stated unconditionally that they would definitely return/probably return. The discrepancy is likely due to different sample sizes (less than one third of respondents were presented with scenarios involving environmental improvements), but also may be the result of some respondents misinterpreting the scenario questions.

Of those who were *not* willing to pay the fee, very few stated that the imposition of such a fee would affect their decision to return to Barbados. Only 5 percent of visitors who faced fee values of US$5 or less were not interested in returning to Barbados if such a fee were imposed (Figure 6).

The primary stated reason among those opposed to paying the fee (39 percent) was that it was not the respondent's responsibility to pay for natural resource management (Figure 8). Roughly 25 percent of those opposed cited mistrust that the funds would be used effectively. Only 6 percent of those opposed stated that they did not believe that natural resources in Barbados were in need of additional protection or management. This low percentage suggests that visitors to Barbados—even those who are opposed to paying an environmental fee—are generally aware of the need for improved environmental management.

Figure 6: Respondents' willingness to pay environmental fee

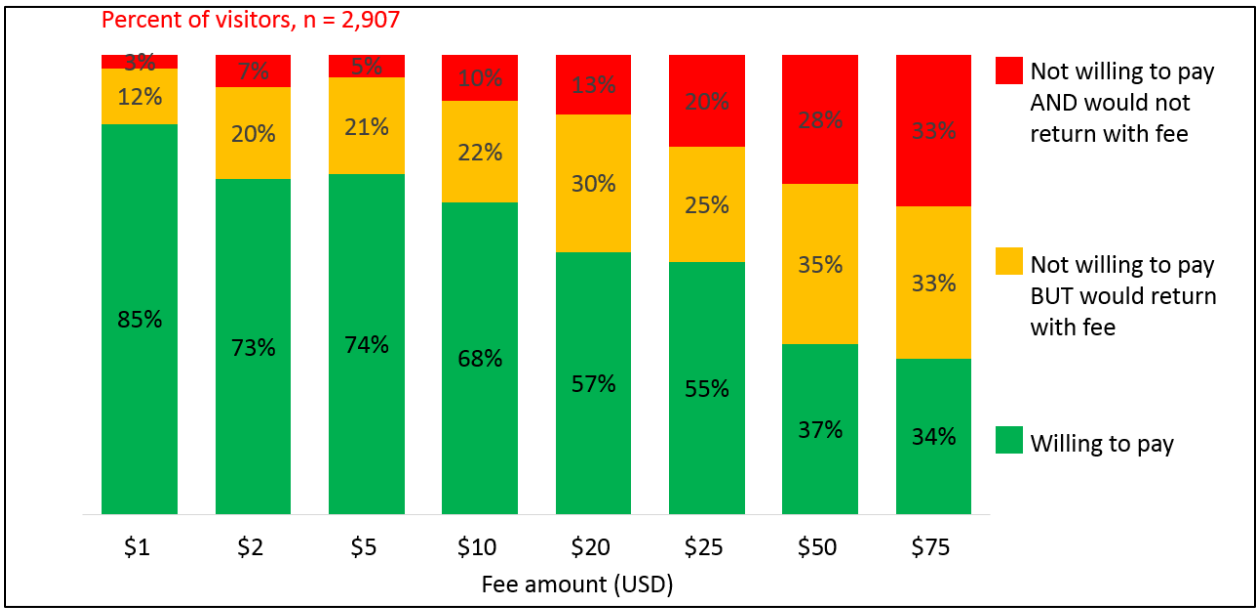


Figure 7: Preferred payment channel for those willing to pay the environmental fee

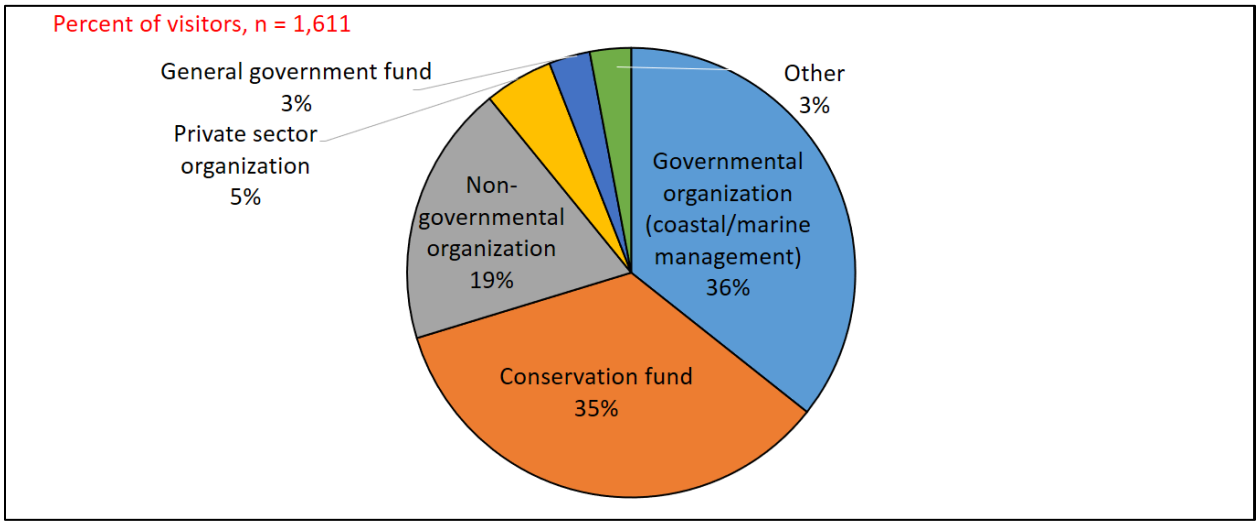
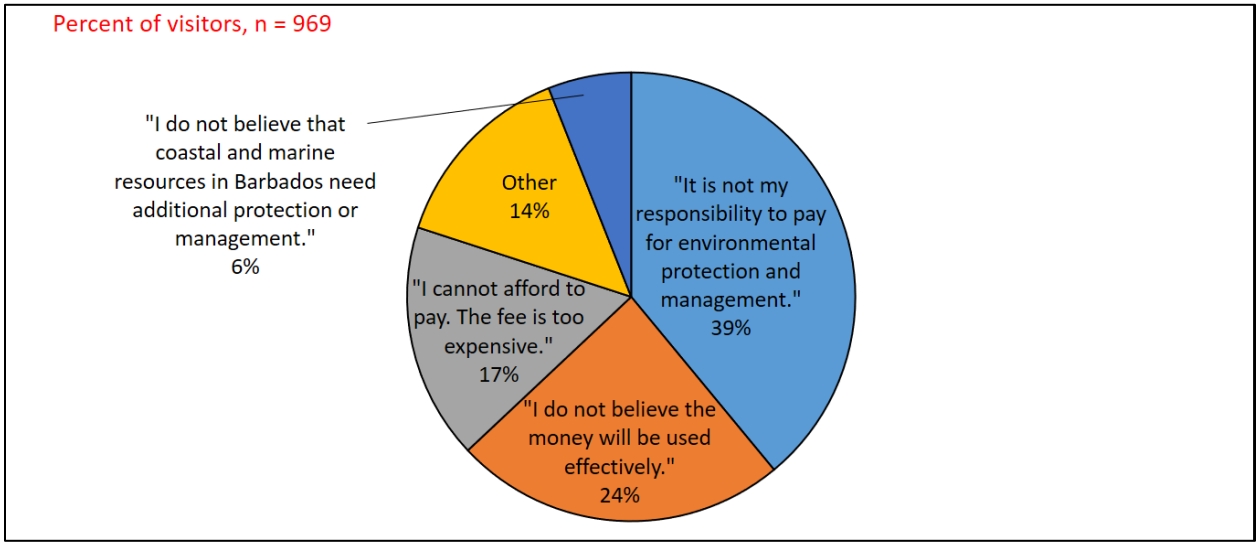


Figure 8: Reason opposed to the fee for those not willing to pay the environmental fee



4.6.1 Analysis of factors associated with willingness to pay the environmental fee

A logistic regression was used to determine the factors influencing the likelihood of a "yes" response to the willingness to pay the conservation fee. The main factors considered were the respondents' demographics and trip characteristics, such as country of origin, level of education, perceptions regarding environmental quality and the level of the fee. Our analysis included

variables that were expected to influence the willingness-to-pay decision based on economic theory and previous results in the literature.

Respondent characteristics found to be associated with willingness to pay are shown in Table 4. Notably, more educated visitors, those with at least a college degree, displayed higher willingness to pay. Based on origin, visitors from the Caribbean region were less willing to pay the fee than from the main source markets: the UK, the US and Canada. There was, however, little statistical difference in willingness to pay between visitors from the UK, the US or Canada. Further, while visitors who had prior travel experience to the Caribbean were found to be more likely to be willing to pay, there was no significant difference in willingness to pay between first-time visitors to Barbados and return visitors. Visitors who reported being likely to return to Barbados were more willing to pay the fee. Not surprisingly, visitors who engaged in more recreational activities in the coastal zone (especially those involving viewing underwater marine life) were more willing to pay the fee, as were respondents who reported viewing wider beaches. However, respondents who rated the quality of the sand as lower appeared to be less willing to pay the fee. Both low- and high-income visitors were more willing to pay than their middle-income counterparts. In our sample, respondents with lower incomes tended to be younger and may therefore be more environmentally aware[3], while respondents with higher incomes have a higher ability to pay.

[3] Younger respondents in the sample were significantly more likely to state that they visited Barbados for the purposes of viewing a coral reef or visiting a marine park.

Table 4: Characteristics associated with willingness to pay conservation fee to help fund the long-term management of coastal and marine resources in Barbados

Variable	Relationship with WTP
Fee level	Respondents were less willing to pay higher fees.
Participation in coastal recreation activities	Respondents who participated in more recreation activities or directly viewed the underwater marine environment were more willing to pay.
Country of origin	Respondents from the Caribbean were less likely to be willing to pay than respondents from the other main markets.
Stated probability of return	Respondents who stated that they would probably or definitely return to Barbados were more willing to pay.
Education	Respondents who completed college or graduate school were more willing to pay.
Perceptions of environmental quality	Respondents who rated sand quality lower were less likely to be willing to pay and respondents who viewed wider beaches were more willing to pay.
Caribbean travel experience	Respondents who travelled to the Caribbean more frequently were more willing to pay.
Income	Respondents with low incomes and high incomes were more willing to pay than respondents in middle-income range.

Note: All factors shown in Table 4 are significantly associated with willingness to pay the environmental fee.

4.7 Choice experiment results

Analysis of the choice experiment (CE) data revealed that visitors prefer higher levels of coastal and marine quality, wider beaches, and lower likelihood of storm risk. Of the four attributes examined in the CE, sea-water quality (described as the risk of incurring a stomach infection from swimming) was the most important to survey respondents—in line with visitors' responses to the contingent behaviour scenarios (Figure 4). Visitors are highly averse to low levels of water quality (i.e., higher chance of an infection) and strongly favour trip alternatives where the infection risk is low. However, storm risk (described as the number of days out of 100 that would be interrupted by a hurricane or tropical storm) and coral reef quality were both more important to visitors than beach width.

Estimates of visitors' willingness to pay (WTP) for levels of the attributes in Table 1 relative to the baseline levels[4] are shown in Table 5. Positive values represent the additional dollar amount that visitors would pay per person in terms of the combined price of air travel and lodging for a one-week holiday trip to the Caribbean for attribute levels that are improved relative to the baseline. Negative values represent the amount by which visitors would have to be compensated in order to accept conditions that are worse relative to the baseline level. As was the case with the contingent behaviour scenarios, it appears that visitors are more sensitive to degradations in environmental quality than to improvements. In other words, the amounts that visitors would need to be compensated for levels worse than the baseline exceed the amounts that visitors would be willing to pay for levels better than the baseline.[5] Considering the prices that respondents reported paying for airfare and lodging for a one-week stay in Barbados (US$1,669 as shown in Table 2), the WTP values suggest that the average visitor would be unlikely to visit if sea-water quality were to reach the condition of "poor," where the probability of an infection were greater than 10 percent, or if storm risk were "high" (10 days out of 100 interrupted by storms).

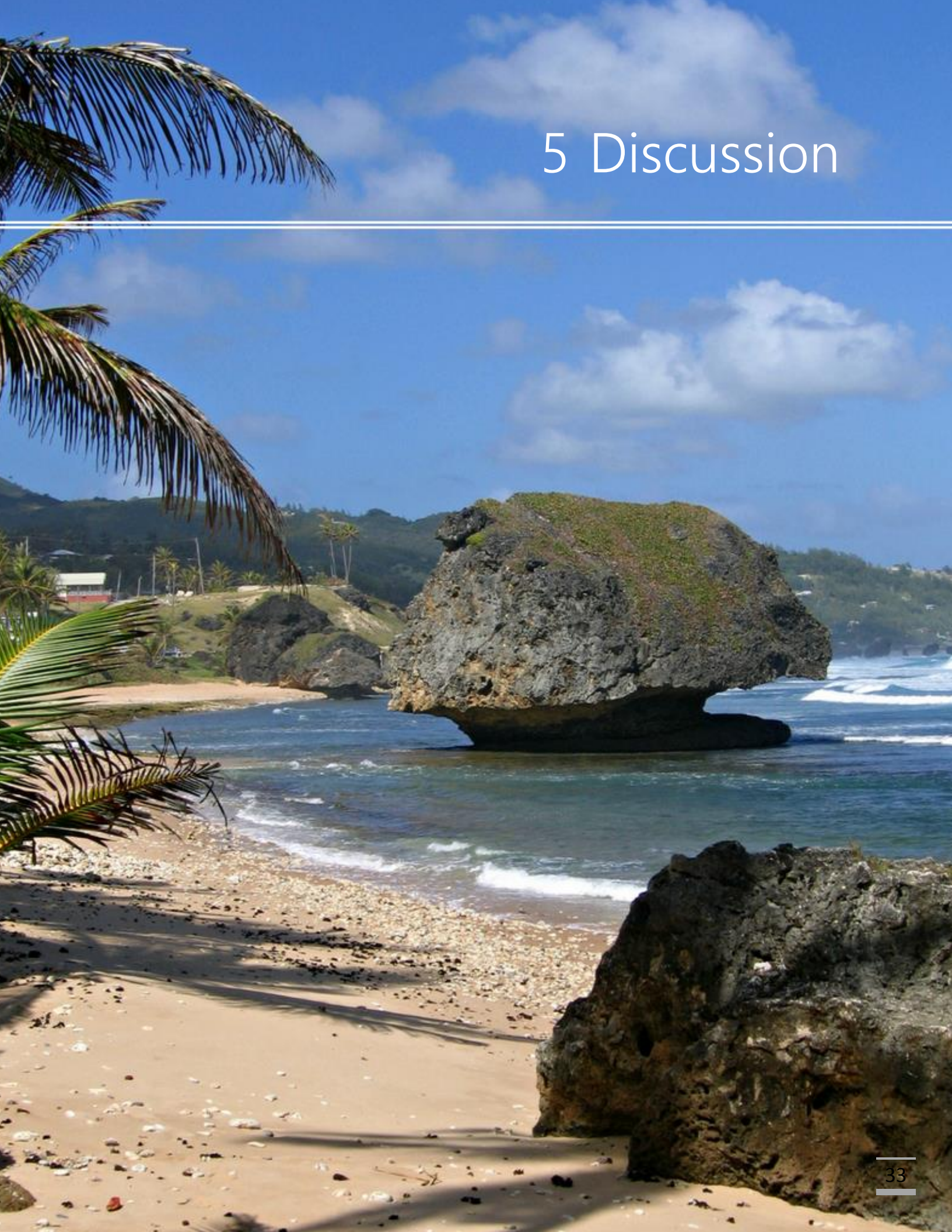
[4] Baseline levels for the attributes were specified as the second-lowest values to permit valuation of positive and negative change and to approximate average beach widths, marine quality and storm risk conditions. The second level of the sea-water quality attribute was chosen for consistency, as sea-water quality data are not available.

[5] This asymmetry in the value of environmental change may be due to the psychological phenomenon known as "loss aversion," whereby potential losses in well-being have a larger impact on decisions than gains (Kahneman et al., 1991).

Table 5: Willingness to pay for trips with coastal and marine attribute levels relative to baseline level

Attribute Levels	Mean WTP (USD)	95% confidence interval Lower bound | Upper bound	
Beach width relative to 6–10 metres			
2–4 metres	-$869	-$1,070	-$669
12–16 metres	$278	$91.52	$464
18–20 metres	$635	$448.12	$821
Sea-water quality relative to 5–10% chance of an infection from swimming			
Poor (> 10% chance)	-$3,465	-$3,842	-$3,088
Good (1–5% chance)	$1,585	$1,367	$1,803
Excellent (< 1% chance of an infection)	$2,351	$2,080	$2,623
Storm risk relative to Low (1 day out of 100 interrupted)			
Virtually none (< 1 day out of 100 interrupted)	$1,009	$810	$1,208
Moderate (5 days out of 100 interrupted)	*Not statistically different than zero*		
High (10 days out of 100 interrupted)	-$1,884	-$2,154.35	-$1,613
Coral reef quality relative to Good for coral viewing (Image B)			
Low (Image A)	-$1,416	-$1,637	-$1,195
Good for fish viewing (Image C)	$640	$455	$826
Excellent (Image D)	$667	$486	$848

5 Discussion



5.1 Principal takeaways

The purpose of this research was to improve our understanding of how tourism in Barbados may be affected by changes in the quality of coastal and marine resources and how funds can be generated to support conservation efforts. Based on analysis of survey data collected from over 3,000 visitors, it is clear that changes in the quality of coastal and marine resources will impact visitor satisfaction, willingness to pay and willingness to return to Barbados. By extension, changes in the quality of coastal and marine resources will impact the national economy of Barbados. Below we list the principal takeaways from this research:

- Visitors to Barbados are heavily involved in activities in the coastal zone.
- Visitors perceive the current coastal and marine environment to be of high quality.
- A significant number of visitors indicate they would probably not or definitely not return to Barbados if environmental quality declines by 5 percent or more, particularly the quality of sea-water.
- Visitors place considerable economic value on the quality of coastal and marine resources and are willing to pay more for better sea-water quality, higher-quality marine life (including coral reefs) and wider beaches.
- A large majority of visitors indicated a willingness to pay a nominal fee (e.g., US$5 or less) to help fund the long-term protection of coastal and marine resources in Barbados.

The finding that visitors to Barbados are heavily involved in coastal and marine recreation confirms earlier observations of tourists' activities in Barbados from 2007 (Schuhmann, 2012; Schuhmann et al., 2013). Importantly, while Barbados is often considered a beach destination, it is clear that visitors to Barbados also enjoy underwater experiences. Approximately 50 percent of visitors reported directly viewing the underwater environment. This result suggests that Barbados could successfully market itself as a destination for underwater activities provided that the quality of the marine environment is maintained.

Respondents rated most attributes of the coastal and marine environment highly. Average ratings of sand quality, beach and sea-water cleanliness and ease of access to beaches and the sea were above 4 on a 5-point scale. Only beach widths and reef quality were rated lower than 4 on average. Despite these favourable ratings, evidence suggests that coastal and marine quality is degrading over time.

5 Discussion

When faced with scenarios involving changes in the quality of coastal and marine conditions, significant percentages of respondents indicated an unwillingness to return to Barbados if conditions degrade. While the quality of all coastal and marine attributes examined appear to affect visitors' willingness to return, the quality of sea-water has the largest influence. Responses to improved conditions were found to be weaker than responses to degradations, yet significant percentages of respondents indicated a higher likelihood of returning to Barbados if the quality of the coastal and marine environment were to improve by more than 10 percent. It is logical to conclude that continued degradation of coastal and marine resources in Barbados will have an adverse impact on return visitation rates; a significant number of visitors who initially expressed a positive likelihood of returning to Barbados indicated that they would probably not or definitely not return to Barbados if environmental quality were to decline, particularly the quality of sea-water.

In addition to impacts on return visitation, the quality of coastal and marine resources is associated with visitors' willingness to pay for travel. Results from the choice experiment suggest that visitors are willing to pay more for trips with wider beaches, higher sea-water quality and healthier marine life (including coral reefs). Of the attributes examined, sea-water quality appears to be the most important to visitors (consistent with the results of the contingent behaviour scenarios), while beach width is the least important. Visitors, on average, are willing to pay approximately US$275 more for a one-week stay where beaches are 12–16 metres wide relative to 6–10 metres wide. Visitors are willing to pay approximately US$640 more for a one-week stay where coral reef quality allows for more marine life and are willing to pay more than US$1,500 per week for improved sea-water quality. Similarly, visitors will pay US$800 less per week for stays where beaches are very narrow and more than US$1,000 less for stays where reef quality is low. These results have important revenue implications for private-sector entities in the coastal zone and suggest that public- and private-sector efforts to improve or maintain the quality of the coastal and marine environment will enhance visitor satisfaction and generate improved revenues.

A large majority of visitors indicated a willingness to pay a nominal fee to help fund the long-term protection of coastal and marine resources in Barbados. Only 5 percent of respondents suggested that if a US$5 fee were in place, they would not return to Barbados. We find little difference in the willingness to pay such a fee across visitors from Barbados' main market points of origin, which suggests that the implementation of an environmental fee would be unlikely to impact relative arrivals from these markets. However, we do find that visitors from the Caribbean region are less likely to be willing to pay the fee. In order to mitigate the potential impact on travel from Caribbean points of origin, the fee might be

selectively applied to visitors from outside the region. While there is no significant difference in willingness to pay between first-time visitors to Barbados and return visitors, visitors who engaged in more recreational activities in the coastal zone (especially viewing underwater marine life) were more willing to pay the fee.

5.2 Caveats and cautions

Responses to the contingent behaviour scenarios, the choice experiment and the WTP question can be used to predict the potential macroeconomic implications of future changes in the quality of coastal and marine resources and/or the implementation of conservation fees. However, such predictions—which were outside the scope of this report—should be undertaken and interpreted with caution. Environmental degradation most often occurs slowly, and changes tend to be incremental. Therefore, visitors may not perceive or react to changes in environmental quality exactly as indicated in our survey. Our results suggest that the impact of environmental degradation may be potentially more significant than improvement, especially with regard to sea-water quality and beach width.

With regard to conservation fees, while some visitors will object to the implementation of such fees, others are likely to judge their use as favourable. Further, depending on how the fee is publicized, visitors' reactions to the imposition of conservation fees may not differ from their reactions to changes in other aspects of travel costs, such as airfare, lodging or meals. For example, if a nominal conservation fee were included in the price of airline tickets, it seems unlikely that visitation would be affected. Because visitors had differing preferences for how the environmental fee would be managed (e.g., by a government agency, marine park fund, etc.), and because respondents gave several reasons for opposing fees, care should be taken as to how the fee management is established and communicated to visitors.

To the extent that our survey responses can serve as a predictor of future visitor behaviour, the effects of changes in environmental quality and the imposition of conservation fees can be expected to be statistically significant at almost all levels of change. Yet because other factors that affect demand for trips to Barbados are likely to change simultaneously, predicting whether or not fees or changes in environmental quality will result in a net loss or gain in visitor arrivals is fraught with difficulty and is beyond the scope of this report. Future research efforts should be directed at estimating the impact of environmental change on macroeconomic indicators such as national output and employment.

6 Conclusions

6 Conclusions

Like many islands in the Caribbean, the economy of Barbados is directly tied to tourism. As a "sun, sand, and sea" destination, the quality and economic viability of the tourism product is directly linked to the quality of the coastal and marine environment. Despite their obvious and widely recognized importance, coastal and marine resources are under intense pressure from local and climate-related factors, which jeopardize the national economy.

The results of this research confirm the direct relationship between the quality of the coastal and marine environment, tourists' willingness to return to Barbados and their willingness to pay for travel. Visitors to Barbados have strong preferences for high-quality beaches, clear water and the presence of healthy coral reefs and other marine life. Moreover, visitors' responses to changes in the quality of coastal and marine resources are asymmetric, such that the response to a decline in coastal and marine quality is significantly stronger than to an equivalent degree of improvement. Nevertheless, the vast majority of visitors are willing to pay a nominal fee to help fund conservation and management of these resources. While the implementation of such a fee could dissuade a small percentage of travellers from returning to Barbados, it could also serve as an important source of funds for conservation efforts and as a signal to travellers that Barbados is making efforts to maintain or improve coastal and marine environmental quality. This research suggests that the gains in arrivals and spending resulting from improvements in coastal and marine quality could serve to mitigate—or possibly more than offset—losses induced by the imposition of the fee.

These findings can be used to assist Barbados in achieving sustainable tourism product development and as a first step in estimating the potential macroeconomic implications of future changes in the quality of coastal and marine resources and the implementation of conservation fees.

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