

POTENTIAL ECONOMIC IMPACTS OF CLIMATE CHANGE ON CARIBBEAN TOURISM INDUSTRIES

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ABSTRACT

Climate change may affect important environmental components of holiday destinations, which may have repercussions for tourism-dependent economies. Changes in snow cover seasonality, increased frequency of heat waves, coral bleaching events linked to increased sea surface temperature, and reduction of beach size as a result of sea-level rise are some of the possible changes; all of these could have negative impacts on regions where the tourism industry depends on environmental features. This paper's research, a questionnaire-based study of tourists in two Caribbean islands, revealed the importance of environmental features for tourists when choosing a holiday destination. It also highlighted the fact that environmental changes as a consequence of climate change could significantly alter tourist preference for holiday destinations. Potential economic impacts may therefore arise in the Caribbean tourism industry due to alterations of the environmental features that make this region attractive for tourism.

KEYWORDS: *Climate change, Tourism, Coral bleaching, Sea level rise*

INTRODUCTION

In recent decades climate change has attracted the world-wide attention, and concern, of researchers from a wide range of scientific disciplines. Economists, conservationists and policy-makers now agree that the global climate is changing (1), and that this will not only affect the environment and

survival of species (2, 3, 4), but it will also have an impact on human systems. Climate change can potentially affect global patterns of tourism because environmental considerations are important components in the decision-making process determining holiday destinations (5). Climate-change-induced changes in the environment are likely to have economic implications, since neither ecological systems nor humans may be able to adapt to these rapid changes (2, 6, 7, 8).

Potential impacts of climate change on environmental features important to tourism

Climate change is not limited to changes in temperature; the environment will also undergo significant changes (1). During the last century, global mean surface temperature has increased by 0.6 °C (9), which was accompanied by rises in sea surface temperature from 0.46 °C to 2.59 °C (10) and an increase of 0.2 metres in sea level (11). Due to the high complexity of the Earth's systems, such changes have been associated with the flooding of coastal areas (12), increases in coral bleaching events (with consequent loss of marine wildlife diversity and abundance) (2), possible changes in frequency and intensity of hurricanes (13), changes in biodiversity distribution (14), and re-colonisation in some areas of mosquitoes transmitting tropical diseases (15). Regions such as the Caribbean are likely to experience many of these changes, which may affect their environment-dependent tourism industry.

Over the past few decades, the Caribbean region has become a very popular holiday destination, with the number of tourists increasing at a higher rate (5.5%) than the global average (4.2%). As a consequence, this region has become one of the most tourism-dependent regions of the world (16). This dependency is particularly marked for those small islands that have few alternatives to tourism (17).

Bonaire and Barbados are two examples of small, tourism-dependent islands in the Eastern Caribbean, whose economies may be vulnerable to global warming. The tourism industry is a major contributor to the economies of both islands, providing 40% of the gross domestic product (GDP) in Bonaire (18) and 12.3% in Barbados (19). Moreover, the tourism industry is based on environmental features that are attractive to tourists yet have been previously mentioned as likely to be affected by global warming (e.g. beach size, pristine coral reefs, diversity of wildlife, absence of tropical diseases).

In our questionnaire-based survey in Bonaire and Barbados, tourists highlighted the importance of environmental features for choosing these islands as their holiday destination. Out of the sixteen attributes we considered in the questionnaire, warm temperatures, clear waters and low risk of tropical diseases were some of the most attractive environmental features. Tourists also indicated other features such as attributes related to marine wildlife (e.g. healthy coral, large and abundant

fish, etc.), beach structure and landscape characteristics as being relevant to their holiday destination choice.

Potential impacts of climate change on repeat visits

Several studies have examined the extent to which climate change can affect a country's economy (tourism industry) through impacts on environmental features. For example, the exposure of low-lying locations to sea-level rise or hurricane impacts may seriously affect infra-structure and cause flooding of coastal areas (20). The resurgence of malaria as a consequence of climate change may involve increases in health expenditures (21), and decreases in visitors to specific locations. In Scotland and the Alps changes in duration and spatial distribution of snow cover is likely to reduce the revenue obtained through recreational winter sports (8). For tropical locations like Bonaire and Barbados, where the tourism industry is highly dependent on environmental features, changes in key environmental components (e.g. coral reefs and beaches), as a consequence of global warming, may cause shifts in preferred holiday destinations (22).

Two open-ended questions were included in our survey to gauge the willingness of tourists to return to Bonaire or Barbados, under the same price conditions, if key environmental attributes, namely coral reefs and beaches, were negatively affected by climate change. Most tourists felt that such changes would be likely to alter their future choice of holiday destination. This result should raise serious economic concern because approximately 40% of the tourists surveyed were revisiting those two islands. If our results are representative of these two islands, economic impacts arising from the consequences of climate change on key environmental attributes would need to be considered in future management strategies.

Inter-island variation in potential impacts of climate change

Are climate change impacts on tourism likely to vary across destinations? The effects of climate change on tourism industries may differ among destinations depending on their location, characteristics, and the key environmental attributes used in promoting these locations as holiday destinations. At present, climate change models have only been applied at regional scales, but these models already indicate differences in how climate change may affect different regions (11); therefore, it should be expected that climate change may also have variable effects at very local scales.

For Bonaire and Barbados, two islands similar in size but with markedly different tourism orientations, the impacts of climate change would have very different tourism-related effects. The mass-beach tourism in Barbados contrasts with the more environmentally friendly tourism developed in Bonaire based on pristine coral reefs (23, 21). Although all environmental attributes

proposed in the questionnaire were of some importance in the selection of these islands as holiday destinations, beach structure was an issue of greater concern, and a more important attraction, for tourists visiting Barbados than those visiting Bonaire. Tourists in Bonaire had a greater interest and concern for coral reefs. Therefore, island-specific strategies should be developed, based on key environmental attributes.

DISCUSSION

Environmental attributes affecting holiday destination choice

Our results confirm both the general appeal of Caribbean islands based on the attractiveness of their environmental attributes, and the remarkable divergence of tourism orientation between our two study islands (24, 25).

Clear waters and warm temperatures were the major criteria for choosing Bonaire and Barbados as holiday destinations. It is likely that these features are generally important in selecting other destinations within the Caribbean region. Tourists in Bonaire mainly chose this island based on marine attributes, some of which have already been described as important features for divers (i.e. fish abundance, coral diversity, etc.) (26, 27). Indeed, our sample in Bonaire included a large proportion of divers and snorkellers. By contrast, tourists in Barbados were mainly attracted by terrestrial features, the most significant being beach characteristics.

Economic impacts of change in key environmental attributes

Environmental features valued by tourists when choosing a holiday destination are not static; they can change due to natural disasters, the tourism industry itself, human exploitation, and to climate change. Alterations in environmental attributes, independently of their original cause, may lead to shifts in holiday destinations (20, 28, 29).

Our study indicated that a high percentage of tourists would be unwilling to return to Bonaire or Barbados if climate change affected negatively two key environmental attributes (reefs and beaches). A reduction in tourism revenue for these islands should therefore be expected. Accurate estimates of economic losses as a consequence of climate changes impacts are difficult to make because (a) there are a number of other important environmental attributes which may also change, attracting other visitors, (b) the cost of holidays can vary, and (c) environmental attributes may also change simultaneously in different world regions. However, our results may be useful if they are considered as indicators to analyse the trends that islands may follow in the future, and to promote mitigation activities.

Island-specific management strategies

Our findings suggest that strategies to mitigate the socio-economic impacts of climate change should be island-specific, and based on a clear understanding of those environmental features that determine attractiveness to tourists. Thus, adaptive management for Bonaire should focus largely on maintaining healthy coral reefs and fish populations, and for Barbados should principally be aimed at maintaining or enhancing beaches.

The establishment of Marine Protected Areas (MPAs) on islands dependent on reef-based tourism, such as Bonaire, may be the best strategy to protect reefs. Although elevated sea surface temperatures will not respect reserve boundaries (14), MPAs in which fishing pressure is absent and landward development limited will provide the best opportunity for reefs to cope with climate change (30).

Adequate coastal management plans and protection strategies will be the key tools for islands dependent on beach-based tourism such as Barbados. These strategies should include enforced setback building regulations, limiting the construction of coastal structures (such structures disrupt natural sand transport patterns and lead to erosion and consequent habitat loss (31)), and preserving beach vegetation.

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