

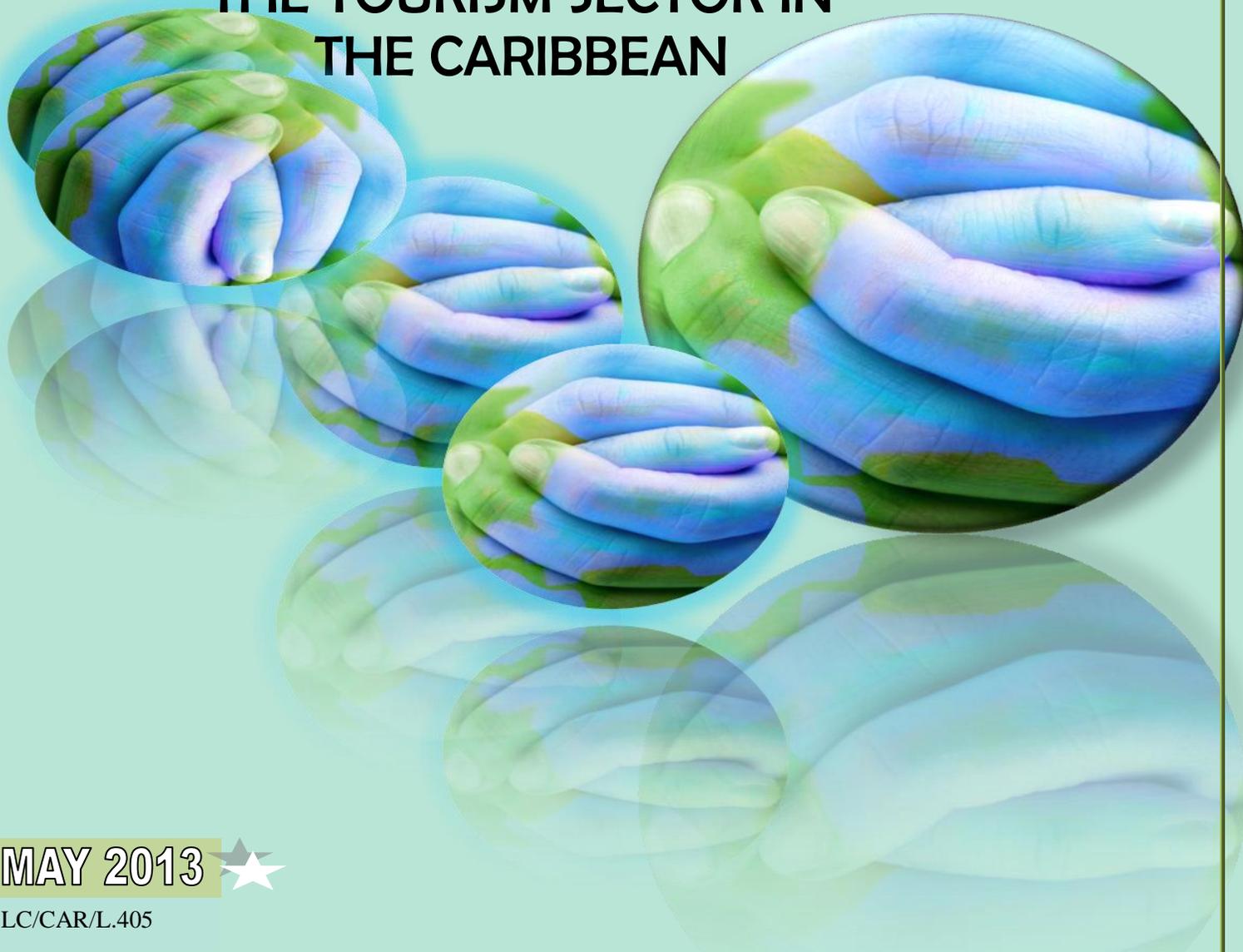


UNITED NATIONS

ECLAC

POLICY BRIEF

AN ASSESSMENT OF THE ECONOMIC AND SOCIAL IMPACTS OF CLIMATE CHANGE ON THE TOURISM SECTOR IN THE CARIBBEAN



MAY 2013 ★

LC/CAR/L.405

INTRODUCTION

For most people, the Caribbean is synonymous with tropical islands with exotic flora and fauna, surrounded by blue seawater and white sandy beaches where the tourism industry can be disaggregated into cruise, all-inclusive, special-interest and ecotourism. Tourism is one of the most important areas of economic activity in the Caribbean. Every year, the Caribbean welcomes 20.1 million visitors, or about 2 per cent of world tourism (figure 1). Despite these variations in the nature of the product, Caribbean tourism is closely associated with climate; climatic factors impact on the time available to engage in leisure activities, on operating costs for tourism establishments and environmental conditions.

This policy brief focuses on Antigua and Barbuda, the Bahamas, Barbados, Belize, Cuba, Dominica, the Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname and Trinidad and Tobago. These islands vary significantly in terms of terrain, size, population, culture and economic prosperity. This policy brief also evaluates the social and economic impacts of climate change on the Caribbean tourism product.

Changes in global climate can have a significant impact on tourism and therefore on the future sustainability and viability of the industry. Indeed, through the Liliendaal Declaration¹ many Caribbean Heads of State and Governments expressed grave concern that sustainable development (particularly as expressed through the Millennium Development Goals) could be threatened due to the effects of climate change and sea-level rise, which have led to “increasingly frequent and intense extreme weather events, damages to the biodiversity, coral bleaching, coastal erosion and changes in precipitation patterns”. The evidence for this lies in the significant, fundamental changes taking place in global air and sea surface temperatures and sea levels.

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) has noted that many of the warmest years in the instrumental record of global surface temperatures have occurred within the last eleven years, from 1995 to 2006² (IPCC, 2007). Along with the rise in surface temperatures, global ocean temperatures have risen, and it is estimated that the world’s oceans are absorbing around 80 per cent of the heat being generated by the global climate system. Consistent with this warming, global sea levels have risen by an average of 1.8 mm per year over the period 1961 to 2003.

Indeed, it can be argued that climate is the main factor into a jurisdiction’s tourism product. For example, especially during winter season in the northern hemisphere, visitors from those countries tend to seek out warmer coastal locations for both leisure and health reasons. Climate determines the type of and demand for tourism activities, as well as the operating costs in terms of heating and/or cooling. In addition to direct impacts, the tourism industry can be affected by indirect environmental changes in water availability, biodiversity loss, reductions in agricultural output, the increased frequency and intensity of natural hazards, coastal inundation resulting in damage to coastal infrastructure and the increased incidence of vector-borne diseases. The Caribbean tourism product is particularly vulnerable to these changes.

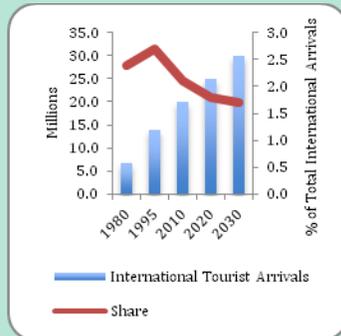
The Caribbean ranks tenth in the world in terms of tourism receipts³. The industry is expected to reach 25 million arrivals by 2020 and about 30 million by 2030. However, its share is expected to decrease to around 1.5% of world tourist arrivals due to faster growth in other destinations.

¹ “Liliendaal Declaration on Climate Change and Development”, Caribbean Community (CARICOM), Georgetown, 2009.

² “Synthesis Report”, Inter-Governmental Panel on Climate Change (IPCC), Geneva, 2007.

³ Chandana, J., “Mastering Caribbean Tourism”, International Journal of Contemporary Hospitality Management, vol. 14, no. 2, pp. 88-93, 2002.

FIGURE 1
INTERNATIONAL TOURIST ARRIVALS TO THE
CARIBBEAN, 1980-2030



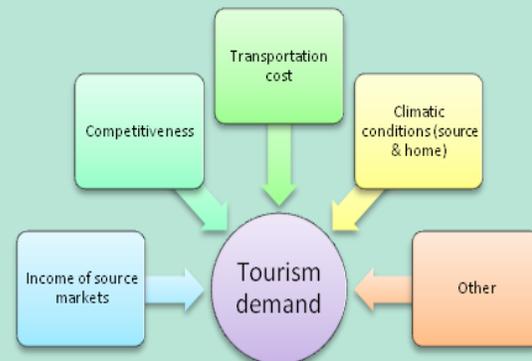
Source: World Tourism Organization (WTO), 2012.

One of the most important elements of the destination experience is climate. Mieczkowski, (1985)⁴ suggested that tourism destinations were usually characterized by climatic conditions that would be most comfortable for the average visitor. In order to explain this, a tourism climatic index (TCI) was developed from the weighted average of seven climatic variables: (1) monthly mean for maximum daily temperature; (2) mean daily temperature; (3) minimum daily relative humidity; (4) mean daily relative humidity; (5) total precipitation; (6) total hours of sunshine; and (7) average wind speed.⁵ The analysis presented in this policy brief calculated the TCI using the Providing Regional Climates for Impacts Studies (PRECIS) system data files for the Caribbean at a resolution of 50 x 50 km. Outputs were generated for each Caribbean State, informed by HadAM3P and ECHAM4 global models along with two Special Reports on Emissions Scenario (SRES) using emission scenarios A2 and B2⁶.

The TCI enables an assessment of the potential impact that climate change would have on the attractiveness of a tourism destination. It does not, however, present a quantitative

assessment of the prospective impact on tourism demand. In order to obtain such an estimate, a standard demand model had been augmented with TCIs for the Caribbean as well as TCIs for the main Caribbean source markets. A tourism demand model of the form outlined in figure 2 has been employed⁷.

FIGURE 2
DETERMINANTS OF TOURISM DEMAND



Source: W. Moore, C. Gomes, D. Alleyne and W. Phillips, *An assessment of the economic and social impacts of climate change on the tourism sector in the Caribbean (LC/CAR/L.394)*, Economic Commission for Latin America and the Caribbean (ECLAC), 2013.

The model is estimated for the period 1977 to 2010 observed at monthly intervals and utilises the variables in table 1. The A2 and B2 scenarios capture the fact that, by 2050, there would be shifts in many of the key components of the TCI. Should travel to the Caribbean become less attractive, there would be serious implications for many Caribbean destinations. In order to capture these climate-induced effects, the TCIs under the A2 and B2 scenarios, have been projected for the period 2010 to 2050, assuming that the growth rate for the explanatory variables is set at the sample period mean. This analysis therefore utilizes a number of scenarios of potential transportation cost and demand for travel to capture the potential revenue from tourism for the Caribbean.

⁴ Mieczkowski, Z., "The Tourism Climatic Index: A Method of Evaluating World Climates for Tourism", *Canadian Geographer*, vol 29, no. 3, pp. 220-233, 1985.

⁵ Before the index was calculated, each variable was standardized to take values ranging from +5 for optimal to -3 for extremely unfavourable.

⁶ A2 - Self reliance, preservation of local identity, continuously increasing population, economic growth. B2 - Local solution to sustainability, continuously increasing population at a lower rate than A2 on regional scales. Source: United Kingdom UKCIP02 *Climate Scenarios Technical Report*. (http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=161&Itemid=287).

⁷ Kim, Y. and Uysal, M., "The Endogenous Nature of Price Variables in Tourism Demand Studies", *Tourism Analysis*, vol 2, no. 1, pp. 9-16, 1997.

Lathiras, P. and Siriopoulos, C., "The Demand for Tourism to Greece: A Cointegration Approach", *Tourism Economics*, vol 4, pp. 171-185, 1998.

Lim, C., "Review of International Tourism Demand Models", *Annals of Tourism Research*, vol 24, pp. 273-284, 1997.

Song, H. and Witt, S., *Tourism Demand Modelling and Forecasting: Modern Econometric Approaches*, Pergamon, Oxford, 2000.

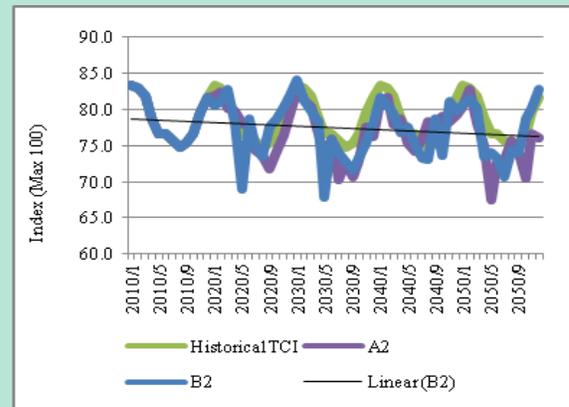
TABLE 1
COMPONENTS OF THE TOURISM CLIMATIC INDEX

Sub-index	Variables	Influence on tourism climatic index	Weight
Daytime comfort index (CID)	Maximum daily temperature Minimum daily relative humidity	Represents thermal comfort when maximum tourist activity occurs	40%
Daily comfort index (CIA)	Mean daily temperature Mean daily relative humidity	Represents thermal comfort over the full 24-hour period, including sleeping hours	10%
Precipitation (P)	Total precipitation	Reflects the negative impact that this element has on outdoor activities and holiday enjoyment	20%
Sunshine (S)	Total hours of sunshine	Positive impact on tourism; (can be negative because of the risk of sunburn and added discomfort on hot days)	20%
Wind (W)	Average wind speed	Variable effect depending on temperature (evaporative cooling effect in hot climates rated positively, while wind chill in cold climates rated negatively)	10%

Source: Z. Mieczkowski, "The Tourism Climatic Index: A Method of Evaluating World Climates for Tourism", *Canadian Geographer*, vol 29, no. 3, 1985.

Using the methodological approach outlined in the previous section, figure 3 provides the historical and forecast tourism climatic indices for the Caribbean under the A2 and B2 climate scenarios. The figure suggests that climatic conditions are likely to deteriorate under both scenarios, suggesting that the Caribbean is likely to become less conducive to tourism activities.

FIGURE 3
HISTORICAL TOURISM CLIMATIC INDICES AND FORECAST TOURISM CLIMATIC INDICES FOR THE CARIBBEAN UNDER A2 AND B2 (2010-2050)



Source: Moore and others, 2013

The results suggest that the summer months are likely to experience the greatest decline in the TCI. However, home conditions during the traditional tourism season (December – April) are likely to improve, which could make it more attractive for visitors from key markets to consider “staycations” as an alternative to overseas trips.

This situation suggests that the climatic changes anticipated under the A2 and B2 climate scenarios are both likely to have large negative impacts on tourism earnings costing (relative to the historical average) an aggregate of almost US\$ 5 billion in lost revenue by 2050 under both scenarios (A2 and B2). In addition to climatic shocks, estimates were made of losses in tourism revenue if the cost of travel to tourism destinations in the Caribbean should rise, due either to higher travel costs or the imposition of green/environmental levies on air travel⁸. A moderate rise in travel costs of 10 per cent would generate losses in tourism revenue of approximately US\$ 8 billion per year (down from an annual estimate of US\$ 12 billion in 2007) by 2050. Such policies would significantly impact tourism destinations.

⁸ The transportation cost variable in the model is shocked to obtain the results.

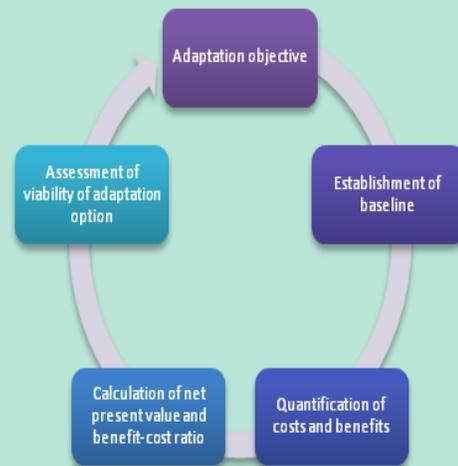
These losses in tourism revenue may be explained by the development of mitigation policies that can influence tourist attitudes towards long-haul travel. These policies operate on the premise that as individuals become more informed about the impact that their travel decisions can have on overall greenhouse gas emissions; there could be some shift in arrivals away from long-haul destinations such as the Caribbean. This will result in a decline in economic benefits of tourism to the Caribbean as it is one of the main sources of job creation, and therefore has important impacts on social development⁹ inclusive of poverty levels.

In order to address this potential decline in visitor arrivals to the Caribbean and the concomitant unemployment and poverty impacts, several mechanisms for adapting (figure 4) to this changing scenario may be employed, which are as follows:

- Do minimum” such as an increase in advertising.
- Green certification and marketing of hotel rooms.
- Carbon-offset programme for all tourists travelling to the Caribbean.
- Implementation of the Caribbean Hotel Energy Efficiency Action Programme (CHENACT), along with carbon trading¹⁰.

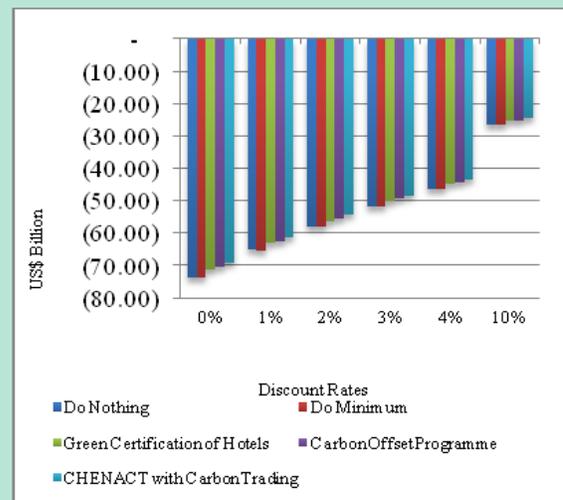
Cost/benefit analyses of each of these adaptation options are presented in figure 5 and recommendations for financing such options are presented in figure 6.

**FIGURE 4
APPROACH TO EVALUATING ADAPTATION
OPTIONS**



Source: United Nations Framework Convention on Climate Change (UNFCCC), 2011.

**FIGURE 5
COST-BENEFIT ANALYSES OF VARIOUS
ADAPTATION OPTIONS**
(billions of United States dollars)



Source: Moore and others, 2013.

⁹ "Travel and Tourism Economic Impact 2012 - Caribbean", World Travel and Tourism Council (WTTC), London, 2012.

¹⁰ The recommendations include the retrofitting of present mini split unit air-conditioning systems to an inverter-type variable refrigerant volume system with heat recovery for hot water, installation of guest room controls, installation of a variable-frequency drive on pool pumps, CUMP, retrofitting of all 40W fluorescent tubes to 25W Sylvania Octron® XP® SuperSaver® ecologic® 3 lamps or an equivalent fixtures with their respective ballasts, and the replacement of all incandescent bulbs with 13W bulbs throughout hotels.

**FIGURE 6
FINANCING ADAPTATION**



Source: Author's research.



CONCLUSIONS AND RECOMMENDATIONS

The results suggest that, under either an A2 or B2 climate scenario world, the Caribbean would become less conducive to tourism activities and that deterioration is likely to occur at the same time as climatic conditions in source markets start improving. Such a situation could result in a shift in tourism activities away from the Caribbean to either 'staycations' or alternative destinations. These climatic shifts are likely to cost the Caribbean an estimated US\$ 8 billion in lost revenue per annum by 2050 (or about 8 per cent of the Caribbean GDP in 2007).

The results of the cost-benefit analysis suggest that, despite adapting the Caribbean tourism product to the effects of climate change, there would still be significant losses. The Caribbean is already implementing the Caribbean Regional Resilience Development Implementation Plan. There are many aspects of this Plan that would result in a more resilient tourism product (such as carbon offsetting). However, the implementation cost of such initiatives would be quite large and would require financial support from donors and other partners. It is therefore important that donor initiatives be coordinated efficiently to tackle the issue of adapting to climate change.

Cost-benefit analyses suggested that priority should be on the following climate change adaptation strategies for building the resilience of the Caribbean tourism industry:

- Building energy resilience (solar water heaters, air conditioning units and solar photovoltaic systems).
- Increasing design wind speeds to withstand the effects of more intense storms.
- Investment in the achievement of internationally-recognised green certification to offset the negative effects that long-haul travel can have on carbon emissions.