



# **Climate Change's Impact on the Caribbean's Ability to Sustain Tourism, Natural Assets, and Livelihoods**

Murray Simpson  
Daniel Scott  
Ulric Trotz

**Inter-American  
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Environmental  
Safeguards Unit

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Dr. Murray Simpson has wide-ranging experience in research on sustainable development, tourism, and climate change and has published extensively in these areas. He has also worked within the public and private sectors on tourism strategy, tourism analysis, and climate change adaptation and mitigation, particularly in small island developing states. He is presently a Senior Research Associate at the Oxford University School of Environment and Geography and the Centre for the Environment. Dr. Daniel Scott is a Canada Research Chair in Global Change and Tourism and a contributing author/expert reviewer for the IPCC; his research focuses on the nexus of people, tourism, environment, and climate change. Dr. Ulric Trotz is the Science Adviser to the Caribbean Community Climate Change Centre and the review editor of the IPCC Working Group II Report and is author of more than 50 publications on climate change issues.

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Internationally and regionally, it is widely recognized that several groups of countries require significant and urgent assistance to adapt to climate change, especially small islands, countries with low-lying coastal areas, and those with areas prone to natural disasters. Caribbean nations are particularly vulnerable to the effects of climate change, sea level rise (SLR), and extreme events (see Table), as a result of their relative isolation, small land masses, concentrations of population and infrastructure in coastal areas, limited economic bases, high dependence on international tourism and climate-sensitive ecosystems (reefs, beaches, and mangroves), and limited financial, technical, and institutional capacity for adaptation. Indeed, experts have consistently identified the Caribbean and small island developing states as the areas most at risk.<sup>1</sup>

Tourism is vital to the economy of the Caribbean and the livelihoods of its people; it accounts for 14.8 percent of the gross domestic product and 15.5 percent of employment.<sup>2</sup> For some islands, the figures are even higher. In 2009, the Caribbean received 19.5 million international tourist arrivals, and tourist receipts reached US\$22.2 billion.<sup>3</sup> Climate not only determines the length and quality of the tourism season, it is also an important driver of tourism demand to some regions, because it affects the natural environment in ways that can either attract or deter visitors.<sup>4</sup> The region has invested heavily in tourism-related infrastructure, most of which lies in the coastal zone. All of these assets are threatened by climate change.<sup>5</sup>

### **Main impacts of climate change and their implications for tourism**

<b>Impact</b>	<b>Implications for Tourism</b>
Warmer temperatures	Altered seasonality, heat stress for tourists, cooling costs, changes in plant-wildlife-insect populations and distribution range, health impacts such as infectious and vector-borne disease ranges
Increasing frequency and intensity of extreme storms	Risk for tourism facilities, increased insurance costs/loss of insurability, business interruption costs
Reduced precipitation and increased evaporation in some regions	Water shortages, competition over water between tourism and other sectors, desertification, increased wildfires threatening infrastructure and affecting demand
Increased frequency of heavy precipitation in some regions	Flooding damage to historic architectural and cultural assets, damage to tourism infrastructure, altered seasonality (beaches, biodiversity, river flow)
Sea level rise	Coastal erosion, loss of beach area, higher costs to protect and maintain waterfronts and sea defenses
Sea surface temperature rise	Increased coral bleaching and marine resource and aesthetic degradation in dive and snorkel destinations
Changes in terrestrial and	Loss of natural attractions and species from destinations, higher

marine biodiversity	risk of diseases in tropical-subtropical countries
More-frequent and larger forest fires	Loss of natural attractions, increase of flooding risk, damage to tourism infrastructure
Soil changes (moisture levels, erosion, acidity)	Loss of archaeological assets and other natural resources, with impacts on destination attractions and agriculture

Source: Adapted from UNWTO-UNEP-WMO, *Climate Change and Tourism: Responding to Global Challenges* (Madrid: 2008).

## Climate Change Trends and Projections

Over the past 50 years, increases in mean air temperature across the Caribbean have been consistent with the observed global warming trend, and they are expected to generally parallel global trends in the twenty-first century.<sup>6</sup> Average air temperatures are projected to increase in all seasons, more so inland than over oceans and in coastal locations.<sup>7</sup> Changes in sea surface temperatures are projected to be similar to those for at least the minimum air temperatures over coastal regions and islands.<sup>8</sup>

Most climate models project total annual rainfall to decrease through all CARICOM countries by an average of 5–10 percent, with decreases amplifying with increased temperatures.<sup>9</sup> Changes in regional precipitation should be treated with greater caution, however: while most projections simulate rainfall decreases, some simulate increases of up to 20 percent. Projected changes in wind speed for the whole of the Caribbean are similarly uncertain. North Atlantic hurricanes and tropical storms appear to have increased in intensity over the last 30 years, although there is still debate about whether this is a long-term trend.<sup>10</sup>

## Sea Level Rise and Storm Surge

As the coastlines of the Caribbean include many low-lying and highly erodible shore areas, the region is particularly susceptible to sea level rise, storm surge, and coastal erosion. Observed SLR in most of the Caribbean has paralleled the global trend over the last 40 years and currently stands at around 1.5–3 millimeters a year.<sup>11</sup> Several recent studies project global SLR of 0.5–2.15 meters by 2100.<sup>12</sup> Furthermore, the Caribbean could experience a significant increase above global averages due to geophysical and gravitational factors.<sup>13</sup>

Almost one-third of Caribbean tourism resorts are at flooding risk from SLR of 1 meter, and many more would have their beach assets substantially eroded or destroyed.<sup>14</sup> The loss of critical beach assets has major implications for property values, destination competitiveness, and marketability. A number of Caribbean cities that are key tourism attractions also have substantial areas at risk if the sea level rises by 1 meter.<sup>15</sup>

While the absolute size of projected economic losses is generally much greater in the larger CARICOM economies, the proportional impacts—the losses compared with the size of the national economy—are generally higher in the smaller economies of St. Kitts and Nevis, Antigua and Barbuda, Barbados, St. Vincent and the Grenadines, and Grenada.<sup>16</sup> Tourism infrastructure is particularly vulnerable in these nations, and tourism contributes a greater proportion to their national economies. A complete and focused analysis of the vulnerability of tourism-dependent small island economies needs to be conducted and evidence-based adaptation strategies developed.<sup>17</sup>

## **Natural Assets**

Climate change will directly affect the natural resource base on which much of the Caribbean tourism industry is based, including its biodiversity and beaches. Coral reefs, in particular, are an important tourist attraction.<sup>18</sup> They play an essential role as physical barriers to ocean waves and as a vital habitat for fisheries.<sup>19</sup> The Reefs at Risk project found that, in 2000, coral reefs provided net benefits in terms of fisheries, dive tourism, and shoreline protection with an estimated value of US\$3.1–4.6 billion.<sup>20</sup> There has been a general increase in the frequency and intensity of coral bleaching<sup>21</sup> and outbreaks of infectious coral diseases.<sup>22</sup> Furthermore, increased sea surface temperatures are expected to cause severe bleaching stress to the reefs of the Caribbean as early as the 2030s, surpassing the ability of many areas to recover.<sup>23</sup>

Next to corals, mangroves appear to be the hardest-hit natural asset. Mangrove cover in the region has declined by 42 percent over the past 25 years, with two of the eight mangrove species now considered *vulnerable* to extinction and two more in *near-threatened* status.<sup>24</sup> Mangroves, in a similar way to reefs, are vital to low-lying coasts, as they protect them from damage caused by storm surges. They also serve as a nursery for fish and other species that support coastal livelihoods. Moreover, they sequester carbon from the atmosphere and are both a source of and a repository for nutrients and sediments for other inshore marine habitats, such as seagrass beds and coral reefs.

Climate change is projected to reduce the availability of freshwater resources in many parts of the Caribbean—in some areas, to a point where these become insufficient to meet demand by local populations and tourists, at least in periods with low rainfall.<sup>25</sup> Since many islands rely on groundwater sources and rainwater harvesting for their water supply, any changes



in the amount, frequency, and intensity of rainfall will affect the amount of water available for extraction. SLR will cause further saline intrusion into aquifers, with as little as 0.1 meter SLR reducing the availability of fresh water in aquifers.<sup>26</sup> In addition, the water table may be altered sufficiently so that fresh water is above the surface and subjected to greater evapotranspiration.<sup>27</sup>

## **Climate and Destination Choice**

One of the main tourism assets of the Caribbean is predictable sunny and warm conditions, particularly during the winter in major market regions in North America and Europe. With changing climatic conditions, two potentially negative impacts are possible. First, some Caribbean destinations may become “too hot” for tourists during some seasons. Surveys of European tourists have revealed the optimal conditions for beach tourism of 27°–32°C<sup>28</sup> are currently prevalent throughout the region.<sup>29</sup> But under climate change scenarios, the number of months in this optimal climatic zone declines somewhat, as some destinations exceed the “unacceptably hot threshold” during the summer. Little impact in the peak winter tourism season is anticipated, however.

The second negative impact is related to the temperature in the countries that tourists come from. As temperatures increase, demand for winter getaway holidays is anticipated to decline, though the extent of this has not yet been quantified. Similarly, if climatic conditions in other destinations—the Mediterranean, for instance—improve sufficiently, they may become more competitive with the Caribbean.

## **Potential Costs of Climate Change to Caribbean Tourism**

Climate change will have an impact on the operating costs of tourism operators, such as insurance, heating-and-cooling costs, pest management, and the need to augment the water supply for drinking and irrigation needs. Of significant importance to tourism will be the effects of extreme events on infrastructure and insurance costs. The Association of British Insurers suggests that insurance premiums for the Caribbean region could increase by 20–80 percent by mid-century.<sup>30</sup> Private sector insurance coverage may no longer be available in particularly high-risk areas, forcing governments to provide insurance for tourism development or causing the retreat of development from these areas.

Annual average losses from wind, storm surge, and inland flooding are estimated to be as high as 6 percent of GDP in some countries, and climate change has the potential to increase

these risks 33–50 percent by 2030.<sup>31</sup> One study found that if no action is taken, increased hurricane damages, loss of tourism revenue, and infrastructure damages could total US\$22 billion a year by 2050 and US\$46 billion by 2100.<sup>32</sup> While there remains debate about the exact amount of losses in regional GDP due to climate change, several studies have found that the impact will be highly significant.<sup>33</sup>

Sea level rise of 1 meter is projected to put 266 out of 906 tourism resorts and 26 out of 73 airports in the Caribbean at risk of inundation.<sup>34</sup> An estimated 49 percent of major tourism resorts in CARICOM would be damaged or destroyed by combined SLR and storm surge and SLR-enhanced erosion, as many lack extensive coastal protection in order to preserve aesthetics of natural beach areas and views to the sea. These figures are particularly worrying, as they give an indication of the shorter term risk of SLR. Beach assets so critical to tourism would severely affected. The longer time frames of sea level rise should also not be an excuse for delay, since putting effective protection measures in place takes considerable time. In fact, previous defense projects have shown that coastal protection infrastructure typically has a lead time of 30 years or more.<sup>35</sup>

International climate policy poses one of the most immediate economic risks to Caribbean tourism. Policies designed to mitigate greenhouse gas emissions are expected to have a considerable impact on long-haul air travel destinations.<sup>36</sup> Of particular concern is the United Kingdom’s Air Passenger Duty; voluntary initiatives such as “carbon offsetting” also present considerable challenges. The United Kingdom is one of the primary sources of tourists in the Caribbean, and the recent doubling of this fee is projected to have a significant impact on travel to the Caribbean.

The effects of climate change in the Caribbean are not events in some distant future. The tourism sector and the economies and livelihoods in the region are already being affected by sea level rise and erosion and also by extreme impacts such as coral bleaching, flooding, and drought. Effective responses are necessary from all stakeholders—government, communities, and the private sector—to reduce vulnerability and increase the resilience of the tourism sector. There is an urgent need for technical and financial resource assistance, enhanced capacity, and evidence-based adaptation strategies in the region that are practical and effective in reducing vulnerability and increasing resilience to ensure sustainable development.

## **Some Political Responses to Climate Change in the Caribbean**

CARICOM, Caribbean countries, and the Caribbean Community Climate Change Centre (CCCCC) have participated in a number of major regional projects designed to build institutional, national, and human capacities. The most important activities to date include National Enabling Activities supported by the U.N. Development Programme; the Caribbean Planning for Adaptation to Climate Change project (1998–2001) supported by the Global Environment Facility; the Adaptation to Climate Change in the Caribbean project (2001–2004), which helped establish the CCCCC in Belmopan, Belize; the Mainstreaming Adaptation to Climate Change project (2003–2009), with GEF funding through the World Bank; and the Implementation of Adaptation Measures in Coastal Zones project (2006–2011), with GEF funding. The CCCCC is also working on a range of tourism and climate change initiatives, one of which is providing an evidence-based approach to the development and implementation of practical strategies to assist communities, the private sector, and national governments in building a sustainable and climate-resilient tourism sector.

In July 2009 the CARICOM Heads of Government approved the Regional Framework for Achieving Development Resilient to Climate Change. They also mandated the CCCCC to develop a comprehensive regional plan for implementation of this strategy. This will identify and establish priorities for activities under each strategic element and goal area of the Framework, allocate responsibilities and outline functional cooperation between regional and national agencies, develop an investment program, and propose a governance regime and a monitoring and evaluation system.

## **Conclusion and Recommendations**

For government and business decision makers in the tourism sector, climate change is a new strategic reality. Increasingly, institutional investors, banks, and insurance companies seek information on the material risks associated with climate change—driven by regulations at national and international levels, physical impacts on business, and the indirect consequences of regulation on business trends, such as changes in the demands for goods and services.<sup>37</sup>

It is clear that any actions to be implemented in the region should be “mainstreamed” and that climate change should be integrated into government decision making while sector-level climate change vulnerability analysis is incorporated into Caribbean tourism planning. This

approach includes important debate and decisions with stakeholders on, for example, how space is used in coastal zones due to strong competition in these restricted areas. The debate will involve costing of assets, cost-benefit analyses, and assessment of losses and damages across related sectors. Not only will decisions be made about land usage and related policies, but the debate will inform adaptation strategies regarding coastal protection and the extent to which governments can commit limited resources and capacities.

Although the impact of climate change on extreme events in the Caribbean remains uncertain, enhanced collaboration with organizations such as the Caribbean Catastrophe Risk Insurance Facility is a “no regrets” strategy that provides benefits—mainly, shorter recovery times following extreme events—regardless of the magnitude of climate change. Given recent developments and discussions at the U.N. climate change conference in Cancun, it may also be possible to leverage microfinance on the implementation of additional insurance coverage.

Coastal management policies should be reviewed and revised to account for SLR and storm surge—with specific attention for regulations related to setback requirements, mangrove and coral reef conservation, beach nourishment, and property decommissioning. Furthermore, management strategies for enhancing the resilience of coral to climate change should be implemented—for example, by reducing pollution and overfishing through the establishment and demarcation of fish sanctuaries, improved management and support of marine protected areas, and more awareness of the impacts of climate change within coastal communities and the private sector. Architectural and engineering coastal protection designs for beach resorts should be market-tested with international tourists in order to avoid unsuccessful or mal-adaptation.

Caribbean leaders and regional groups like the Caribbean Tourism Organization, the Caribbean Hotel Association, and the Caribbean Council have strongly recommended that international mitigation policies need to be carefully designed so as not to disadvantage the least developed countries or destinations.<sup>38</sup> The airline industry has made similar recommendations.<sup>39</sup> More robust lobbying and pressure from the industry and from governments is required to ensure that the Caribbean tourism sector is protected and treated in a fair and equitable manner. Strategies to reduce vulnerability to the various climate mitigation policies and oil price fluctuations need to be developed.<sup>40</sup> International policies that provide the most regional control over revenues generated by any charges or levies to international air travel should be supported,

as should any regional or national carbon-neutral tourism initiative, while taking care to consider emissions from air travel as a significant factor.<sup>41</sup>

As sea level rise is transforming coastal tourism in the Caribbean, SLR vulnerability mapping should be used to inform revised Tourism Master Plans and Land Use Plans.<sup>42</sup> Future tourism development should be redirected away from highly vulnerable areas, and priority areas for coastal protection need to be identified. Where feasible, high-resolution remote sensing data can be used to monitor and evaluate engineering adaptations and support insurance risk assessments.

There is an urgent need to improve the information base with regard to the risks posed by climate change impacts in the Caribbean and the capacity of adaptation options to cope with different levels of climate change. This will allow the international community to provide greater evidence-based adaptation assistance. **A complete and focused analysis of the vulnerability of tourism-dependent small island economies needs to be conducted, and evidence-based adaptation strategies need to be developed.**<sup>43</sup>

If Caribbean countries are unable to adapt to climate change due to lack of capacity or resources, they will experience direct and substantial economic and environmental negative impacts on tourism—their most important industry sector. This will not only affect national economic development and increase unemployment, it will have serious social and cultural consequences for communities. Without significant support from the international community, governments' ability to pursue sustainable development in the region and achieve Millennium Development Goals will be severely compromised.

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<sup>1</sup> IPCC 2007; UNWTO, UNEP, and WMO 2008; Hall 2008; Deutsche Bank Research 2008.

<sup>2</sup> Caribbean Hotel & Tourism Association 2004.

<sup>3</sup> UNWTO 2010.

<sup>4</sup> Scott and Lemieux 2009.

<sup>5</sup> Simpson et al. 2008a.

<sup>6</sup> Simpson et al. 2009.

<sup>7</sup> Ibid.

<sup>8</sup> Ibid.

<sup>9</sup> Ibid.

<sup>10</sup> Holland and Webster 2007; Kossin et al. 2007; Elsner et al. 2008.

<sup>11</sup> Bindoff et al. 2007.

<sup>12</sup> Rahmstorf 2010.

<sup>13</sup> Rahmstorf 2007.

<sup>14</sup> Ibid.

<sup>15</sup> Simpson et al. 2009.

<sup>16</sup> Simpson et al. 2010.

<sup>17</sup> Ibid.

<sup>18</sup> Ibid.

<sup>19</sup> Simpson et al. 2009.

<sup>20</sup> Burke and Maidens 2004, p. 58.

<sup>21</sup> Miller et al. 2009.

<sup>22</sup> Harvell et al. 1999.

<sup>23</sup> Donner et al. 2005; Mimura et al. 2007.

<sup>24</sup> Global Marine Species Assessment 2007.

<sup>25</sup> Simpson et al. 2009.

<sup>26</sup> Bobba et al. 2000.

<sup>27</sup> Mimura et al. 2007.

<sup>28</sup> Rutty and Scott 2010.

<sup>29</sup> CARIBSAVE Partnership 2009.

<sup>30</sup> Association of British Insurers 2004.

<sup>31</sup> Caribbean Catastrophe Risk Insurance Facility 2010.

<sup>32</sup> Bueno et al. 2008..

<sup>33</sup> Bueno et al. 2008; Caribbean Catastrophe Risk Insurance Facility 2010; Simpson et al. 2010.

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<sup>34</sup> Simpson et al. 2010.

<sup>35</sup> Hallegatte 2008.

<sup>36</sup> Simpson et al. 2008b; UNWTO, UNEP, and WMO 2008; Pentelow and Scott 2010.

<sup>37</sup> For example, see U.S. Securities and Exchange Commission 2010.

<sup>38</sup> Caribbean Hotel Association and Caribbean Tourism Organization 2007.

<sup>39</sup> Greenaironline 2009.

<sup>40</sup> For example, see Gössling et al. 2008.

<sup>41</sup> Goodall 2009; Gössling 2009.

<sup>42</sup> See Simpson et al. 2009, 2010.

<sup>43</sup> Ibid.