




THE CARIBBEAN AND CLIMATE CHANGE

THE COSTS OF INACTION



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**The full report is available online at
http://www.sei-us.org/climate-and-energy/Caribbean_Inaction_Cost.htm
<http://www.gdae.org/CaribbeanClimate.html>**



EXECUTIVE SUMMARY

The two dozen island nations of the Caribbean, and the 40 million people who live there, are in the front lines of vulnerability to climate change. Hotter temperatures, sea-level rise and increased hurricane intensity threaten lives, property and livelihoods throughout the Caribbean. As ocean levels rise, the smallest, low-lying islands may disappear under the waves. As temperatures rise and storms become more severe, tourism—the life-blood of many Caribbean economies—will shrink and with it both private incomes and the public tax revenues that support education, social services, and infrastructure. And these devastating impacts will occur regardless of the fact that Caribbean nations have contributed little to the release of the greenhouse gases that drive climate change.

This report offers a preliminary examination of the potential costs to the island nations of the Caribbean if greenhouse gas emissions continue unchecked. In many respects, this study uses a methodology similar to our 2007 report on the costs of inaction for the state of Florida. As in that report, we compare an optimistic scenario and a pessimistic one. Under the optimistic scenario—called “rapid stabilization” or “low-impact”—the world begins taking action in the very near future and greatly reduces emissions by mid-century with additional decreases through the end of the century. Under the pessimistic scenario—called “business-as-usual” or “high-impact”—greenhouse gas emissions continue to skyrocket throughout the 21st century. Both scenarios are based largely on the 2007 report of the Intergovernmental Panel on Climate Change (IPCC), a panel of more than 2,000 scientists, whose consensus findings are approved by all participating governments, including the United States. The cost of inaction, or the difference between these two scenarios, may be seen as the potential savings from acting in time to prevent the worst economic consequences of climate change.

The projections presented here are by no means a comprehensive picture of all climate damages. Indeed, they are based on just three categories of effects:

- Hurricane damages, extrapolated from average annual hurricane damages in the recent past;
- Tourism losses, assumed to be proportional to the current share of tourism in each economy; and
- Infrastructure damages, due to sea-level rise (exclusive of hurricane damage), which are projected as a constant cost per affected household.

For just these three categories—increased hurricane damages, loss of tourism revenue, and infrastructure damages—the Caribbean’s annual cost of inaction is projected to total \$22 billion annually by 2050 and \$46 billion by 2100. These costs represent 10 percent and 22 percent, respectively, of the current Caribbean economy.*

Table ES-1. Caribbean Region—Cost of Inaction

(High-Impact minus Low-Impact Scenarios)

Total Caribbean	Cost of Inaction (\$US Billions)			
	2025	2050	2075	2100
Storms	\$ 1.1	\$ 2.8	\$ 4.9	\$ 7.9
Tourism	1.6	3.2	4.8	6.4
Infrastructure	8.0	15.9	23.9	31.9
Total	\$10.7	\$21.9	\$33.7	\$46.2
% Current GDP	5.0%	10.3%	15.9%	21.7%

Sources: Authors' calculations. Amounts in 2007 dollars; percentages based on 2004 GDP.



Table ES-2 presents the cost of inaction for each country included in the study. While the regional average is large, rising from five percent of GDP in 2025 to 22 percent in 2100, there is also considerable variation around this average; some countries have much higher projected impacts. The projected cost of inaction reaches an appalling 75 percent of GDP or more by 2100 in Dominica, Grenada, Haiti, St. Kitts & Nevis, and Turks & Caicos, and smaller, but still impressively high levels for a number of others islands.

In addition to providing preliminary estimates of the costs of climate inaction for the Caribbean, this report also looks more closely at the implications for two larger islands, Puerto Rico and Cuba, and considers the parallels and contrasts for one of the mainland countries facing the Caribbean—Colombia.

* Note that in one key respect, the methodology used here departs from our Florida analysis and instead is based on the World Bank’s 2002 projection of climate impacts on selected Caribbean nations. In particular, we compare projected future climate damages to the current (2004) population and GDP (gross domestic product, or national income) for each country. This allows us to isolate the impacts of climate change, separated from the impacts of population and economic growth. In the later years of this century, GDP will likely be larger than it is today for most or all of the region. (Projection of future GDP for the numerous Caribbean nations and territories is beyond the scope of this preliminary study.) However, some of our damage estimates are projected as percentages of GDP. So as the island economies grow, the damages will grow as well.

Table ES-2. Caribbean Region Summary—Cost of Global Inaction on Climate Change

	Cost of Inaction: % of current GDP			
	2025	2050	2075	2100
Anguilla	10.4	20.7	31.1	41.4
Antigua & Barbuda	12.2	25.8	41.0	58.4
Aruba	5.0	10.1	15.1	20.1
Bahamas	6.6	13.9	22.2	31.7
Barbados	6.9	13.9	20.8	27.7
British Virgin Islands	4.5	9.0	13.5	18.1
Cayman Islands	8.8	20.1	34.7	53.4
Cuba	6.1	12.5	19.4	26.8
Dominica	16.3	34.3	54.4	77.3
Dominican Republic	9.7	19.6	29.8	40.3
Grenada	21.3	46.2	75.8	111.5
Guadeloupe	2.3	4.6	7.0	9.5
Haiti	30.5	61.2	92.1	123.2
Jamaica	13.9	27.9	42.3	56.9
Martinique	1.9	3.8	5.9	8.1
Montserrat	10.2	21.7	34.6	49.5
Netherlands Antilles	7.7	16.1	25.5	36.0
Puerto Rico	1.4	2.8	4.4	6.0
Saint Kitts & Nevis	16.0	35.5	59.5	89.3
Saint Lucia	12.1	24.3	36.6	49.1
Saint Vincent & the Grenadines	11.8	23.6	35.4	47.2
Trinidad & Tobago	4.0	8.0	12.0	16.0
Turks & Caicos	19.0	37.9	56.9	75.9
U.S. Virgin Islands	6.7	14.2	22.6	32.4
TOTAL CARIBBEAN	5.0%	10.3%	15.9%	21.7%

Sources: Authors' calculations. Percentages based on 2004 GDP.

CASE STUDY: PUERTO RICO



Puerto Rican rainforests, mangroves, and beaches, important to tourists and residents alike, are extremely vulnerable to climate change. Most of the population lives in or near coastal zones, and most economic activity is located there as well, including most hotels, hospitals, and electric power plants. More than half of the population lives in the San Juan metropolitan area, a coastal city that is very close to sea level. A rise of three feet in sea level would flood large parts of the city.

The cost of global climate inaction for Puerto Rico is projected to reach \$2.5 billion annually by 2050 and exceeds \$5 billion by 2100. These costs represent nearly three percent and six percent, respectively, of Puerto Rico's current GDP (see Table ES-3). As with all other projections in this report, these figures reflect impacts from only three categories, namely from decreased tourism, hurricane damages, and infrastructure damage due to sea-level rise.

Although the projected damages are higher, in dollars, than for most other islands, they represent a smaller fraction of Puerto Rico's larger GDP.

Table ES-3. Puerto Rico—Cost of Inaction*(High-Impact minus Low-Impact Scenarios)*

Puerto Rico	Cost of Inaction (\$US Billions)			
	2025	2050	2075	2100
Storms	0.2	0.4	0.7	1.1
Tourism	0.2	0.5	0.7	1.0
Infrastructure	0.8	1.6	2.4	3.2
Total	\$1.2	\$2.5	\$3.8	\$5.2
% Current GDP	1.4%	2.8%	4.4%	6.0%

Sources: Authors' calculations. Amounts in 2007 dollars; percentages based on 2004 GDP.

CASE STUDY: CUBA



Cuba, the largest island in the Caribbean, faces unique challenges that make it particularly vulnerable to the effects of climate change. Over 10 percent of Cubans live less than a mile from the shoreline, a lower share than on many smaller Caribbean islands, but a large number of people nonetheless. Cuba has the longest coastline among Caribbean islands, and a land mass big enough to be hit by hurricanes moving along several different storm paths. Its 11 million people have limited income levels and modest living conditions.

The cost of global climate inaction for Cuba is estimated at nearly \$5 billion annually by 2050, growing to over \$10 billion by 2100, from impacts on tourism, hurricane damage, and infrastructure impacts due to sea-level rise. These losses amount to almost 13 percent and 27 percent, respectively, of Cuba's current GDP (see Table ES-4).

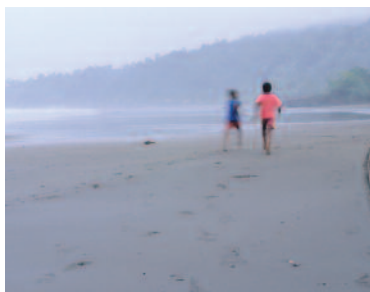
Table ES-4. Cuba—Cost of Inaction*(High-Impact minus Low-Impact Scenarios)*

Cuba	Cost of Inaction (\$US Billions)			
	2025	2050	2075	2100
Storms	0.3	0.8	1.4	2.2
Tourism	0.2	0.4	0.6	0.8
Infrastructure	1.8	3.6	5.4	7.3
Total	\$2.3	\$4.8	\$7.4	\$10.2
% Current GDP	6.1%	12.5%	19.4%	26.8%

Sources: Authors' calculations. Amounts in 2007 dollars; percentages based on 2004 GDP.

Twenty-two percent of the Caribbean's total costs of global climate inaction falls on Cuba, reflecting its status as the region's largest island. The cost of inaction as a percentage of GDP is slightly above average, although debates over the interpretation of Cuban GDP data make these percentages uncertain. Cuba's projected losses are, however, minimized both by lower-than-average hurricane damages, and by the relatively small size of the tourism industry. As tourism expands, so too will Cuba's exposure to climate damages.

CASE STUDY: COLOMBIA



This report focuses principally on the islands of the Caribbean, but the term “Caribbean” is sometimes used more broadly to also include the countries of Central America and the northern coast of South America. While analysis of the costs of climate inaction for all countries surrounding the Caribbean is beyond the scope of this report, we look briefly at the impacts on one of the coastal countries, Colombia. Unlike our examination of the Caribbean island nations, however, our discussion of Colombia is solely qualitative and does

not include quantitative projections of economic impacts.

Colombia’s Caribbean coastline is over 1,000 miles long and includes several of the country’s largest cities and much of its economic infrastructure, generating 16 percent of Colombia’s GDP. Agriculture and cattle ranching are important economic activities of the region. Tourism is also important all along the coast, especially in the colonial city of Cartagena and the Caribbean islands of San Andrés and Providencia, although tourism’s contribution to GDP is only 2.3 percent.

Colombian studies examining the consequences of a one meter (39 inches) sea-level rise over the next 100 years conclude that in addition to the erosion of beaches, marshes, and mangroves, there could be permanent flooding of 1,900 square miles in low-lying coastal areas, affecting 1.4 million people, 85 percent of them in urban areas. For the Caribbean coastal area, about five percent of crop and pasture land would be exposed to various degrees of flooding; nearly half of that area is classified as highly vulnerable. At the same time, the intensification of droughts, desertification, and soil degradation could nearly double the size of Colombia’s northeastern desert. Another anticipated consequence of climate change is the total loss of glacial ice within 100 years, with perhaps three-fourths lost by 2050. The retreat and disappearance of glaciers will affect water availability, hydropower generation and ecosystems.

Colombia faces some of the same consequences as Caribbean islands from sea-level rise and warming, as well as a unique set of challenges from impacts like the ecological and economic consequences of melting glaciers at high altitudes. Given Colombia’s economic, social and political challenges, adaptation measures to lessen the impacts of climate change may be difficult to afford.

The bottom line remains the same in Colombia as in the Caribbean islands: equitable and sustainable development will face new challenges, as sorely needed resources will be diverted to meet the rising costs of global inaction, in countries that make only the smallest contributions to the emissions that cause climate change.

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