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# Climate Change & The Bahamas: Information Brief

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## Purpose

This brief provides information on the current state of the climate, projected climate change, and its effects on the physical and social environment of The Bahamas. As a small island developing state (SIDS), The Bahamas is among the most vulnerable countries in the world to climate change. A range of climate change hazards – from increased frequency of major hurricanes to sea level rise to changes in rainfall and flooding – all interact to affect people, industries, and the environment with the potential for significant and permanent impact.

## What is Climate Change?

Many people correctly associate climate change with increased intensity of hurricanes. Major hurricanes, as seen with Hurricanes Matthew (2016), Irma (2017), and Dorian (2019), are becoming more frequent as sea levels rise and precipitation intensifies<sup>1</sup>. 2020 was the most active hurricane year in the North Atlantic since 2005, with up to 30 named storms. Notable studies have linked changes in hurricane development and frequency to climate change<sup>2-5</sup>. But what is climate change?

Climate describes the long-term atmospheric conditions in a specific region. Climate change refers to a change in the average state of the local, regional or global climate and/or the variability of climatic properties. This change lasts for an extended period (i.e. decades or longer) and may be due to natural processes, such as volcanic eruptions, as well as by consistent human-influenced activities that impact land and atmospheric composition<sup>6</sup>.

Research reveals that Earth has a history of warming and cooling. However, there has been strong consistent warming since the 19th century<sup>7</sup>. This dramatic warming is attributed to

anthropogenic (human-caused) activities, which include upsetting Earth's energy budget with greenhouse gas emissions<sup>8</sup>.

According to the US National Oceanic & Atmospheric Administration, 2020 was the second-hottest year on record following 2016<sup>9</sup>. Natural and anthropogenic processes both change the earth's heat energy budget<sup>8,10,11</sup>. Greenhouse gases, such as carbon dioxide, flow to the upper atmosphere and form a natural gas "blanket" around Earth to trap heat and help sustain life on Earth. Some heat is reflected onto Earth and some escapes to space<sup>12</sup> (Left panel of Figure 1). With advances in agriculture, technology, and development in the past centuries, carbon dioxide and other greenhouse gases have increased<sup>12</sup> (Right panel of Figure 1), trapping more heat in Earth's atmosphere.

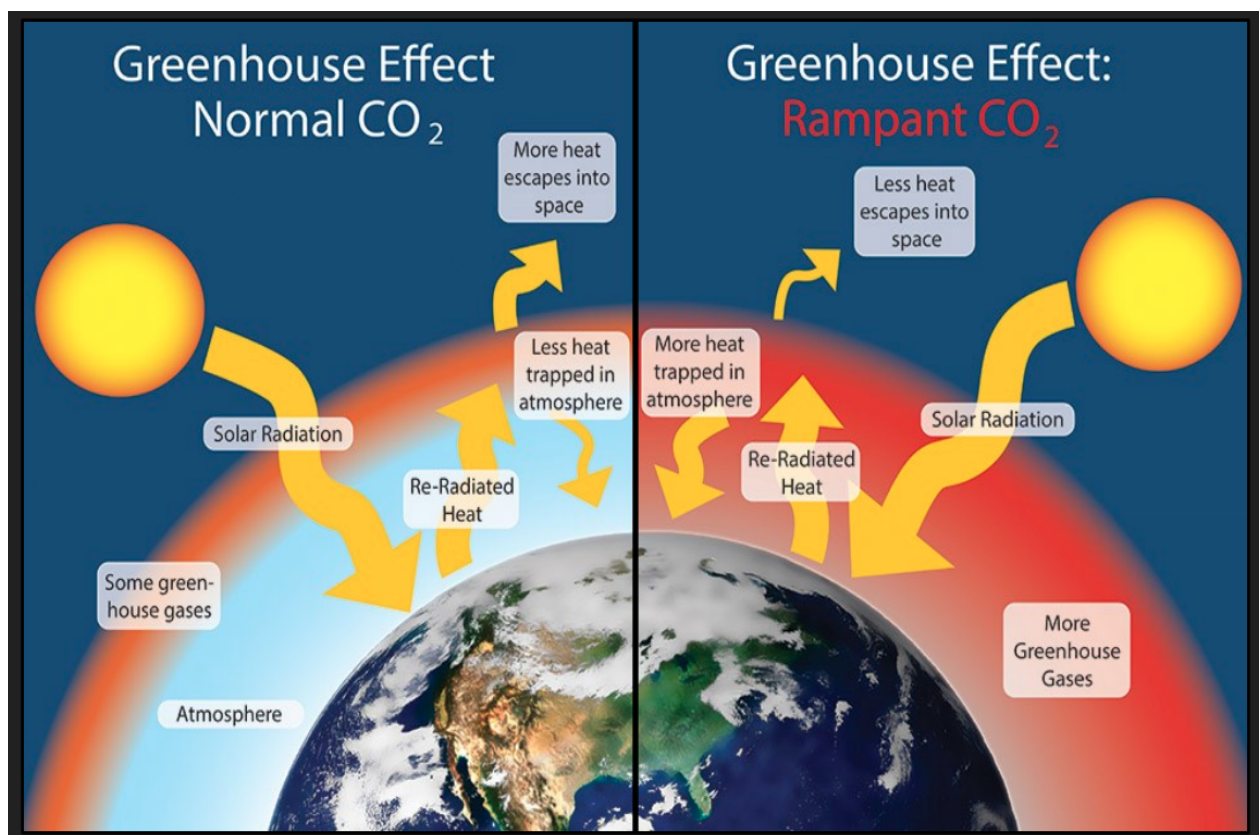


Figure 1 shows the difference between normal greenhouse warming with natural carbon dioxide emissions (left) and the increased warming with increases in carbon dioxide emissions because of human activities (right). Image by Will Elder, National Park Service (<https://www.nps.gov/goga/learn/nature/climate-change-causes.htm>) [modified]

## Key Climate Change Hazards

As an island nation located between 20°N and 30°N, The Bahamas is vulnerable to many climate change hazards (See Table 1). As global temperatures increase, there are risks of more frequent major hurricanes, rising sea levels, declining marine life and increased flooding with implications for tourism, fisheries and human health.

Table 1 shows climate change hazards that will affect The Bahamas directly and indirectly.

	Change	Direct Consequence	Indirect Consequence
<b>Air Temperature</b>	Increase	More precipitation and regional deep convection <sup>5,13,14</sup>	More intense storms <sup>2,3</sup> Impacts on human health, agriculture, tourism, and other industries <sup>15</sup> Higher likelihood of drought and water scarcity with increased precipitation rate <sup>16</sup>
<b>Oceans</b>			
Temperature	Increase	Ocean heat capacity increases at all levels <sup>16,17</sup> Thermal expansion of water molecules <sup>16</sup>	Melting glaciers <sup>15,18</sup> Increase in precipitation <sup>5,13,14</sup> Lack of oxygenation in deep water <sup>16,17,19</sup> Sea level rise and ocean volume expansion <sup>15,16</sup> Degradation of coral reefs and marine life <sup>16</sup>
Alkalinity	Decrease	Carbon dioxide absorbed in the ocean changes the chemical composition of the ocean <sup>19</sup>	Affects calcium carbonate shells of marine organisms and coral reefs <sup>19</sup> Threatens Bahamian industries in conch, lobster, and crab harvests
Stratification	Increase	Makes it difficult for cold water nutrient water to upwell for marine organisms <sup>16,17,20</sup> Affects global air and ocean circulation <sup>12,17</sup>	Impacts biodiversity and fisheries <sup>20</sup> Changes regional weather patterns <sup>12</sup>
<b>Tropical Cyclones/ Hurricanes</b>			
Frequency	None	Little to no change in the total number of hurricanes <sup>2</sup> Frequency of major hurricanes may increase <sup>2,3</sup>	Increase in hurricane uncertainty
Intensity	Increase	More intense storm surges (more flooding) <sup>21,22</sup> More intense winds <sup>23-25</sup> More intense rainfall <sup>5,26</sup>	Increases in migration for those affected by hurricanes <sup>27</sup> Impacts on human health and medical response <sup>28</sup> Increases in physical and financial damages <sup>15,20,29</sup>
Intensification rate	Increase	More intense winds and precipitation in a shorter amount of time <sup>5,23-26</sup>	Increase in hurricane uncertainty

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## Key Risks of Climate Change for The Bahamas

### 1. Food (In)Security

Food security implies that food is more than just stably produced and available but also economically and physically accessible to the consumer<sup>31</sup>. Population growth, geography, spikes in food prices, changes in consumption, land degradation and water scarcity are all drivers of food insecurity<sup>31</sup>. Climate change is yet another driver and is set to alter the relationship Bahamians have with food.

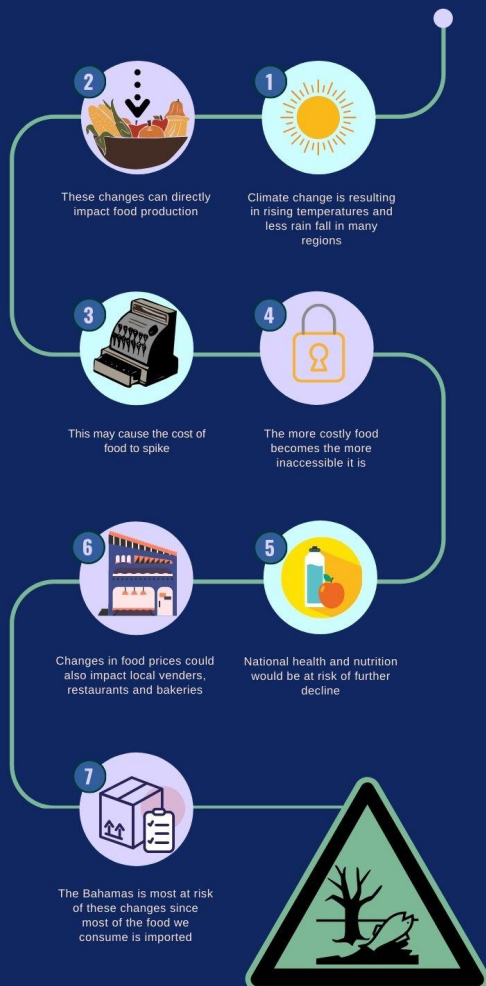
Agriculture in The Bahamas is currently limited, contributing less than 7% to the GDP. This is in part attributed to poor soil quality, low precipitation levels, scarce freshwater, high exposure to tropical storms and hurricanes, insufficient technological investment and development and a lack of human capital<sup>32</sup>. This has led to imported food accounting for 90% of the food available in The Bahamas.

While food security in The Bahamas is highly susceptible to external factors, climate change increases the risk of food insecurity<sup>33</sup>. Climate change affects external food sources and determines the quality, quantity, and accessibility of food in The Bahamas. The trickle-down effect of this can impact national nutrition and the tourism industry. Furthermore, vulnerable groups and communities will be most impacted by climate change-induced food insecurity<sup>34</sup>. This includes people living on, just above or below the poverty line, women and children, and people living on the Family Islands.

For the small percentage of subsistence farmers and fisher people in The Bahamas, particularly those residing on the southern islands, their way of life and the contributions they make to their communities is threatened by climate change. Many islands in The Bahamas are virtual food deserts where access to various imported foods is limited and expensive. For this reason, Family Island residents typically rely on local foods produced on the islands. For example, sustaining subsistence farms will gradually become more challenging with projected increases in temperature, extreme storms, sea-level rise, drought and decreases in freshwater sources.

Rising sea temperatures and ocean acidification threaten the survival of coral reefs in The Bahamas<sup>34</sup>. Without coral reefs, The Bahamas risks the reduction and loss of many marine species that are consumed locally<sup>34</sup>. For the fishing community who already struggle with issues of overfishing, pollution and habitat destruction, this presents yet another hurdle to overcome<sup>34</sup>. These climate change impacts can drastically alter the livelihoods, health and nutrition of all Bahamians and may trigger the relocation of residents.

# Climate Change and Food Security



## 2. Displacement

In the aftermath of Hurricane Dorian, it was officially reported that 9,840 people residing in The Bahamas were displaced as a result of the storm<sup>35</sup>. This degree of displacement was unprecedented and was linked to a king tide that virtually submerged Abaco and Grand Bahama. Seventy people were reported to have lost

their lives while others are still unaccounted for<sup>35</sup>. Impacts such as these are projected to increase as a result of climate change. Given that the majority of Bahamian residents live near the coast, the forced movement of people is expected to rise<sup>27</sup>.

Climate change-induced displacement is essentially the forced movement of people who are under the immediate threat of a climate-related event<sup>36</sup>. Displaced people rarely have sufficient time to plan their movement and are thus extremely vulnerable. Displaced people in The Bahamas may move internally, that is to an unaffected part of the impacted island or to another island in the country. Others may seek refuge in another country altogether. Wherever displaced people may find themselves during or after a crisis, they typically face immediate physical, economic, social and even legal challenges. This is particularly true for communities and individuals who, before their displacement, were already marginalized or vulnerable. These groups may include financially burdened individuals and families, women and children, residents living in underdeveloped settlements, differently-abled people, members of migrant communities and members of the LGBTQ community<sup>35</sup>.

In general, displaced people are confronted by uncertainty and insecurity which puts their overall health and well-being at risk. For instance, overexposure to cold, damp and flood conditions can put stress on the body, possibly developing into hypothermia. A person, navigating through potentially contaminated and debris-filled water, runs the risk of physical injury and

exposure to bacteria<sup>37</sup>. Furthermore, displacement may hinder access to food and potable water sources<sup>38</sup>. Such risks to health and well-being are especially heightened when access to proper facilities is limited or unavailable for some time and prolonged by homelessness and sudden unemployment. The insecurity and uncertainty of temporary housing also expose displaced people, particularly children, to high physical and health risks<sup>27,39</sup>.

Displacement caused by climate change can also have extensive effects on community and cultural bonds. When climatic events, like Hurricane Dorian, cause the mass destruction of homes, places of worship, social gathering locations and schools, those affected are also stricken by the collective loss of traditions, identity and a sense of belonging<sup>27</sup>.

## Climate- forced Displacement

**In the aftermath of Hurricane Dorian, 9,840 people were displaced in the Bahamas.**

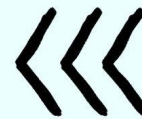
More Bahamians will face the reality of forced displacement should climate change continue to trend upward.



With 70% of Caribbean people living near the coast the risk of displacement caused by climate change is high.



Vulnerable groups and communities are most negatively impacted by displacement

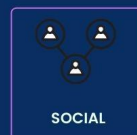


PHYSICAL & PSYCHOLOGICAL

Impacts on Displaced People Include



ECONOMIC



SOCIAL



Table 2 adapted from WTO-UNEP-WMO (2008) *Climate Change and Tourism: Responding to Global Challenges*

 <b>CLIMATE CHANGE AND TOURISM</b> <b>CLIMATE IMPACTS AND IMPLICATIONS</b>	
<b>WARMING TEMPERATURES</b> <ul style="list-style-type: none"> <li>• Altered seasonality</li> <li>• Heat stress for tourists</li> <li>• Cooling costs</li> <li>• Increased insect populations</li> </ul>	<b>MORE INTENSE STORMS</b> <ul style="list-style-type: none"> <li>• Risk for tourism facilities</li> <li>• Increased insurance costs</li> <li>• Business interruption costs</li> </ul>
<b>LESS RAIN FALL AND INCREASED EVAPORATION</b> <ul style="list-style-type: none"> <li>• Water shortages</li> <li>• Competition over water</li> <li>• Desertification</li> </ul>	<b>SEA LEVEL RISE</b> <ul style="list-style-type: none"> <li>• Coastal erosion</li> <li>• Loss of beach area</li> <li>• Higher costs to protect and maintain waterfronts</li> </ul>
<b>SEA SURFACE TEMPERATURE RISE</b> <ul style="list-style-type: none"> <li>• Increased coral bleaching</li> <li>• Marine resource and aesthetics degradation in dive and snorkel destinations</li> </ul>	<b>CHANGES IN MARINE AND TERRESTRIAL BIODIVERSITY</b> <ul style="list-style-type: none"> <li>• Loss of natural attractions and species</li> </ul>
	

### 3. Tourism

The Bahamas' tourism industry relies significantly on beaches, biodiversity and warm temperatures. As detailed in Table 2, these natural resources are "climate-sensitive" and can be easily disrupted by climate change, affecting the attractiveness of The Bahamas as a tourist destination<sup>40-42</sup>. In the short term, upkeeping the industry may require extensive investments in infrastructure and technologies.

However, this may make vacationing in The Bahamas more expensive<sup>40</sup>. Furthermore, with seasonality changes occurring globally, tourists, particularly those from colder climates, may feel less inclined to risk certain comforts or even their health and safety to visit The Bahamas<sup>42</sup>. To this end, climate change may lead to a decline in the tourist industry over time, placing a large percentage of the Bahamian workforce at risk.

## 4. Human Health

Climate change will have both direct and indirect impacts on human health<sup>43</sup>. Indirectly through extreme heat and weather events and directly by increasing pathogen transmission<sup>43,44</sup>. With global temperatures increasing, disease-producing organisms, or pathogens are better able to survive and multiply in an environment with favourable conditions: warmer, more humid, and moister<sup>44</sup>. This may increase vector-borne and zoonotic diseases, where pathogens are transmitted to or among humans by an arthropod vector (e.g. Zika virus by mosquitoes), and pathogens are transmitted between vertebrate animals and humans (COVID-19 virus)<sup>43</sup>. As conditions become more favourable at different latitudes, vector-borne pathogen populations will likely expand geographically<sup>44</sup>.



Additionally, there will likely be increases in heat-related strokes and deaths, increased food and water insecurity and more physical injuries and death due to flooding and storms<sup>43,45</sup>. With expected increases in major hurricanes, we can expect mental health challenges to rise as cases of post-traumatic stress disorder, anxiety, and depression may increase, as well as interruptions to emergency medical care as damage unfolds<sup>28</sup>.

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## Next Steps

The Bahamas is already experiencing impacts of climate change which will continue to increase as global temperatures rise. We must prepare to address the many impacts of climate change that threaten all aspects of life in the country. This requires the development and implementation of evidence-based adaptation and mitigation strategies that will reduce the risks of climate change for all, particularly the most vulnerable.



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