

CARIBBEAN INSTITUTE FOR METEOROLOGY AND HYDROLOGY
CARIBBEAN REGIONAL CLIMATE CENTRE

Climate Services for the Caribbean Society
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Brief for Policy-makers within the Health Sector #1: June 2020

Climate Services and Health: Exploring the Policy Options

Recommendations from the Caribbean Pilot Programme for Climate Resilience (PPCR)
(<https://caribppcr.org.jm>)

This Policy Brief:

- Summarises the major impacts of weather, climate and climate-related health risks on human health within the Caribbean;
- Discusses major issues towards building adaptation and resilience to the impacts of the risks within the region; and
- Highlights the suite of products, packages and services produced by the Caribbean Regional Climate Centre (RCC) that can assist health policy makers in their decision making and planning.

Key Issue(s)	Recommendation(s)
<p>There is a paucity of hydrometeorological data needed for making estimations for safe yield and environmental flows for surface water resources, particularly in smaller islands across the region, is problematic due to the paucity of weather and climate information.</p>	<p>Financial and human resources made available for adequate, well maintained observation networks of higher spatial density that include Automatic Weather Stations. Primary focus should be placed on epidemiological data on morbidity and mortality owing to the different weather, climate and climate-related risks.</p>
<p>Multi-disciplinary research is needed to develop new lines of climate products and early warning systems that predict the prevalence of climate-related health risks; such as wildfires and allergic asthma reactions.</p>	<p>Support regional scale studies multi-disciplinary studies of the impact of weather and climate events and their associated disease outbreaks on the health sector and the development of modelling frameworks to predict these events.</p>
<p>Translating predictions of disease breakouts into calculations of climate health risks can assist the sector to make better decisions on how to allocate scarce resources (for example, finance, personnel, equipment and pharmaceuticals). They can help identify high-risk communities by monitoring environmental factors, alerting local communities and health providers to harmful conditions, and increasing awareness and preventive actions through education and training campaigns.</p>	<p>Foster the developing, testing and implementation of a regional based climate health index or the application of an existing index to calculating climate health risks within the region</p>

Key Issue(s)	Recommendation(s)
Climate information products related to flood and drought, tropical cyclones, and extreme temperatures and heat, at a range of timescales (for example, hourly to decadal), have potential applications in the Caribbean health sector.	Sector access to and application of freely available operational climate information products developed by the Caribbean RCC in some instances, in association with its national and regional health partners in support of health decision making is critical.

Increasing regional capacity to develop climate services for health

Due to predicted changes in the global averages and variations of climate, the current impacts of climate on the health sector will likely exacerbate. In light of this, the World Health Organization (WHO) has deemed climate change as the greatest health concern of the 21st century. Setbacks experienced by Caribbean small island developing states (SIDs) to take advantage of the opportunity presented by the development and integration of climate services into national and health sector planning and practice, as well as a general deficiency in intersectoral platforms or meeting spaces has been recognized [26]. The Caribbean RCC continues to work alongside national Ministries of Health and Met Services across the region, as well as regional health bodies (CARPHA and PAHO) as well as international institutions and research institutes to make strides in increasing regional capacity to develop climate services for health.

Under the 2013-2017 United States Agency for International Development (USAID) Programme for Building Regional Climate Capacity in the Caribbean (the BRCCC Programme) the Consortium of Regional Sectoral Early Warning Information Systems Across Climate Timescales (EWISACTs) Coordination Partners was established, spearheaded by CIMH. In 2017, CARPHA joined the initiative as the lead health partner on the Consortium of Regional Sectoral Early Warning Information Systems Across Climate Timescales (EWISACTs) Coordination Partners to support the region's adaptation to extreme weather, increasing climate variability and climate change. Major strides made through this initiative include the development and dissemination of the Caribbean Health Climate Bulletin and the commencing of the development of a climate driven spatio-temporal modelling framework as an early warning tool in the fight against mosquito-borne diseases transmitted by the *Aedes aegypti*, further discussed within this document.

Commencing in 2019, the Caribbean regional track of the Pilot Programme for Climate Resilience (PPCR) in the Caribbean is one of two regional tracks of the global PPCR. Components of the ongoing Regional Track of the Caribbean PPCR are being completed by five regional organizations. Under PPCR, the Caribbean RCC works towards building climate resilience and increasing regional capacity to develop climate services through:

- Improvements in the acquisition weather data across Caribbean PPCR countries, the development of priority climate products and services for some PPCR countries.
- Complementing ongoing initiatives under the Global Framework for Climate Services (GFCS).
- Building the capacity of national meteorological services to enhance their delivery
- of workshops on their expanded role as national climate centres.
- Increase in the capacity of backup storage of regional climate data.

Climate Information for Health

Climate is a key variable in managing the overall burden of disease, particularly in developing countries where the ability to control climate-sensitive diseases constrains the prospects of achieving the Sustainable Development Goals. To mitigate its adverse effects, the health sector needs to understand and quantify the specific effects of climate variability and change both on the overall disease burden and on opportunities and effectiveness in the public health response. The Caribbean RCC produces a range of climate information products and tools that increase the capacity of the health sector to better manage impacts of weather, climate and climate-related risks.

Heat Stress

- The Caribbean Heat Season is the part of the year during which we regularly get excessively hot days and heat waves.
- Few excessively hot days and heatwaves before 1995. Many more excessively hot days and heatwaves since 1995.
- Heat Season mostly restricted to August-October before 1995. Heat Season now twice as long. Due to global warming, typically the Caribbean Heat Season now is from May-October, but heat waves can occur as early as March and as late as November. The greatest risk for heat stress will occur during these months.

Impacts on Health within the Caribbean

- Lack of conclusive data or studies on the effects of heat stress on health within the region; however, the issue is an ongoing and increasing concern, particularly within the farming community.

Temperature anomalies indicate above, normal and below average heat for the particular period covered by the analysis and is a great reference point to determine possible health impacts of temperature anomalies compared to previous times. These include:

<u>Climate Events</u>	<u>Monitors</u>	<u>Outlooks</u>	<u>Bulletins</u>
<ul style="list-style-type: none">• Prolonged number of hot days• Heatwaves	<ul style="list-style-type: none">• Mean Temperature Anomalies	<ul style="list-style-type: none">• The CariCOF Caribbean Climate Temperature Outlook• The CariCOF Heat Outlook	<ul style="list-style-type: none">• The Caribbean Health-Climatic Bulletin

Vector-borne Diseases

Vector-borne diseases are human illnesses caused by parasites, viruses and bacteria that are transmitted by vectors. Climate is one of the factors that influence the distribution of diseases borne by vectors. Other factors include, human modification of the landscape, the diversity of animal hosts, and human behaviour that affects vector-human contact, among other factors. Mosquito-borne diseases (Dengue fever, Chikungunya, Zika) predominantly dominate the Caribbean region.

Impacts on Health within the Caribbean

- **Dengue Fever** - In January 2019, the Caribbean Public Health Agency (CARPHA) warned the Caribbean region of an expected spike in dengue fever and called on communities to exercise caution and support the elimination of mosquito breeding sites to help combat the virus. A full year later, the number of individuals in the Americas having contracted the mosquito-borne virus is approaching 3 million with at least 1,372 recorded deaths (the highest number of cases on record) with Antigua and Barbuda having the greatest per capita rate within the region. The Pan American Health Organisation (PAHO) and other experts have pointed to climate change as one of the leading causes for the surge in numbers, with poor environmental management and increased adaptability of mosquitoes listed as other causes [6,28].
- **Zika** - CARPHA reported 558 positive cases for the Zika virus within the region, from the 2771 specimens received at the CARPHA laboratory during the 2015 Zika outbreak.
- **Chikungunya** - Chikungunya is responsible for periodic epidemics in both endemic and previously nonendemic areas where competent mosquitos are present. Between the period from December 2013 to August 2014, 576,500 suspected laboratory-confirmed CHIKF cases were reported [18].

Precipitation-related products indicate water availability or shortage which are linked to the distribution of mosquito populations and, to a lesser extent, infection rates [29]. These include:

<u>Climate Events</u>	<u>Monitors</u>	<u>Outlooks</u>	<u>Bulletins</u>
<ul style="list-style-type: none">• Drought• Dry Spell• Wet Spell• Flood	<ul style="list-style-type: none">• SPI Monitor• SPEI Monitor	<ul style="list-style-type: none">• The CariCOF Caribbean Climate Outlook• The CariCOF Drought Outlook• The CariCOF Dry Spells Outlook• The CariCOF Wet Spells Outlook	<ul style="list-style-type: none">• The Health-Climatic Bulletin

Severe Weather Systems

The Atlantic Hurricane season covers the period of the year in which the Caribbean and the Atlantic is plagued by Tropical waves and cyclones and runs from May/June to October/November of each year. These severe weather systems are often accompanied by flood rains, high winds and occasionally storm surges.

Impacts on Health within the Caribbean

- Severe weather systems can result in physical injuries and even loss of life. The best example of this is the Great Hurricane of 1780, the deadliest Atlantic Hurricane on recorded, was responsible for the loss of nearly 5,000 lives within the Caribbean, with Barbados accounting for 4326 of these deaths [15]. A more recent example would be Hurricane Maria 2017 that, in addition to numerous injuries, was credited with 65 deaths in Dominica, as well as 3 deaths in Haiti.
 - Psychological effects and mental disorders in the wake of natural disasters is a common incidence. For example, among the commonly reported sources of psychological distress by residents of Dominica, in the wake of Hurricane Maria 2017, were anxiety and hopelessness about the future, disillusionment and resentment, feelings of loss and bereavement, feelings of guilt and a need for greater emotional support [7, 9].
 - Runoff and flooding resulting from hurricane rainfall and storm surge can contaminate sources of drinking water. For example, in 2004, a storm surge associated with Hurricane Francis increased the chloride levels from 400 to 13,000 mg/L in some of the well fields on North Andros in the Bahamas [30].
 - These extreme weather events can damage or exceed the capacity of water infrastructure. Existing hurricane activity already affects water infrastructure in Jamaica through landslides that compromise dam reservoir integrity and damage pipelines, damage to intake works and boreholes through sediment and debris, damage to pump stations either directly to floods or loss of power [30].
- * Information on tropical cyclone and severe weather systems is readily accessible through Tropical Storm watches, warnings, advisories and outlooks produced by each country's national weather service.

Sahara Dust

Sahara dust travels thousands of miles from the Sahara region to the Caribbean annually on prevailing upper level winds.

Implications for Health

- Exposure to outdoor fine particulate matter is the fifth most common risk factor for death worldwide, accounting for 4.2 million deaths and 103.1 million disability adjusted life-years in 2015 [20].
- Air Pollution contributes to the development of pulmonary and cardiovascular diseases and has been linked to adverse effects on fetal development during pregnancy and lung growth restrictions in children [20].
- Studies on pediatric asthma accidents and emergency admissions in the Caribbean due to Sahara dust have been conflicting. Moteil 2008 and Gyan et al. 2005 shows an increase in respiratory health effects in association with Sahara dust days; however, Propero et al. 2008 shows this correlation to be non-existent [12].

Sahara dust products may help the health sector in their response to the dust-related illnesses associated with Sahara Dust. These include:

Bulletins

- The Caribbean Health-Climatic Bulletin
- * Sahara Dust Updates are produced by CIMH during period of significant activity. Additionally, 7-day regional dust forecast, produced and updated by CIMH are readily available at: <http://dafc.cimh.edu.bb/dust-prediction/>.

The Health-Climatic Bulletin

The Health-Climatic Bulletin is a climate-smart tool developed and disseminated by the Caribbean Public Health Agency (CARPHA), the Pan American Health Organization (PAHO) and the Caribbean Institute for Meteorology and Hydrology (CIMH) to help the health sector to manage climate risk. The HCB:

- Offers insights on the typical climate conditions of the upcoming season or forecast period
- Provides an outlook (how wet, how dry, how hot etc.) for the upcoming quarter in the Caribbean, and offers key climate messages for that period
- Advises on the health implications arising from this seasonal climate information.

The HCB guides health professionals that manage health systems to identify and prepare for upcoming favourable or inclement climate conditions in the Caribbean in the very near future. It does this by suggesting several implications of forecasted climate in a number of key areas including respiratory illness, non-communicable diseases, vector borne illness, gastrointestinal illness, physical injury or death, and well-being and mental health. Use of this information can help to inform strategic and operational decisions.

The range of temperature and precipitation-related climate monitoring and forecast products, mentioned above, are updated monthly by a large team of regional and national level climate experts. Operationally, the monthly timestep is already useful for agriculture – helping the sector to make better decisions. The Caribbean RCC continues to expand its range of products. Although specific products have not yet been developed for other climate-related risks, mention of these potential risks are made in the HCB. These include:

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|-------------------------------|--|
| Allergens | The prevalence of current wheeze among Barbadian children aged 6–7 years and 13–14 years was 19.2% and 20.9%, respectively [16]. In another study, the prevalence of current wheeze in the 11–19-year age group was 13.1% in Trinidad and 13.4% in Tobago [12]. While causes of the observed increase in asthma prevalence are not clearly understood, current evidence suggests that gene–environment interactions underlie most of the increase and worldwide variations [24]. |
| Wildfires | Currently, many Caribbean countries are experiencing actual increases in the number of fires [2,21,25], as projected by climate change studies. However, there is a lack of epidemiology studies to ascertain the contribution of wildfires to regional morbidity and mortality rates. |
| Food and Water-borne diseases | Recent studies have indicated that Barbados, Jamaica, and Trinidad and Tobago are countries with endemic leptospirosis and the highest annual incidence in humans (10, 7.8, and 12 cases per 100 000, respectively) in the world after Seychelles . Leptospirosis incidence and prevalence data are lacking due to inadequate laboratory diagnostic capacity and weak surveillance systems [17]. |

All products are freely available on the Caribbean RCC website at <http://rcc.cimh.edu.bb>.

Enhancing Health and Climate Research

In recent times, the impacts of mosquito-borne viruses on health within the region has become a primary concern of regional bodies such as CARPHA, PAHO and the Caribbean Community (CARICOM) Secretariat. The annual Caribbean Mosquito Awareness Week, initially launched in 2016 to raise awareness of the Zika virus, is evidence of the seriousness this risk poses. This naturally led to a need for research to support the rise in awareness. To this end, under the BRCCC programme, the Caribbean RCC partnered with international research leaders such as the State University of New York, the University of Florida, and the London School of Hygiene and Tropical Medicine in developing of a modelling framework as an early warning system for predicting the prevalence of diseases caused by the *Aedes aegypti* mosquito, shown to be highly correlated with drought, excess rainfall and minimum temperature [22,23].

Dust clouds travelling across the northern tropical Atlantic to the Caribbean often reach concentrations exceeding United States Environmental Protection Agency (EPA) standards for particulate matter of 10 microns or less (PM₁₀) and finer particles of 2.5 microns or less (PM_{2.5}), posing serious health risks. In response to the lack of routine air quality monitoring programmes in regional territories, the Dust and Air Quality forecasting Centre (<http://daqc.cimh.edu.bb>) housed at CIMH has taken the initiative toward developing an early warning system aimed at mitigating against adverse health effects of Sahara dust within the region. Preliminary results from this study agree with in situ measurements made at sites in several Eastern Caribbean islands. Currently, CIMH provides 7-day dust and air quality forecasts for the Eastern Caribbean using the advanced WRF-Chem modelling system.

Under the 2015-2017 BRCCC programme, the Caribbean RCC has completed phase 1 in the development of a regional Heat Health Early Warning system. Conducted via the Climate Predictability Tool (CPT), these studies have shown the strength of the interannual variability of the El Nino Southern Oscillation (ENSO), particularly in 1-3 day heatwave forecasts, as a predictor for heatwave frequency at seasonal time scales. With the completion of phase 1 and the incorporation of regional heat outlook maps into operations at CIMH, the study is currently in phase 2 of development. Phase 2 of this development involves:

- Developing historical time series of heat stress for regional territories
- Creating national or within-country time series of morbidity and mortality related to heat stress to identify critical alerting thresholds. This is particularly problematic given the paucity of epidemiology studies within the region, particularly regarding non-traditional health risks.
- Building a seasonal heat stress forecast model
- Co-developing an alerting protocol for heatwaves across timescales as part of a "weather and Climate Ready Nations" programme.

Health and climate are strongly interlinked and as such climate risk management is crucial to the sustainable development of the agricultural sector within any economy. The Caribbean RCC continues to make strides in the development and implementation of weather and climate monitoring and prediction tools supporting climate risk management within the health sector and strongly believe that climate risk management within the region can be enhanced by good policy making. The policy suggestions made within this brief are grounded in reality and thought-through as to their benefit to health within the region.

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The Caribbean Pilot Programme for Climate Resilience (PPCR) is a climate change adaptation initiative of the global PPCR supported by the Climate Investment Funds. The Caribbean PPCR has two complementary tracks. The first track consists of country based investments in six vulnerable countries and the second is a regional track involving regional organizations working in the Caribbean in key sectors.

Main objectives:

1. To improve regional processes to acquire, store, analyse access and disseminate climate relevant data
2. To pilot and scale up innovative climate resilient initiatives in the region

For more information on the Caribbean PPCR, please visit <https://caribppcr.org.jm>