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# CAYMAN ISLANDS CLIMATE CHANGE RISK ASSESSMENT (CCRA )

Key risks scored in terms of magnitude, urgency and confidence

# EXECUTIVE SUMMARY AND POLICY CONTEXT

The Cayman Islands Government (National Climate Change Committee) published a draft 'Climate Change Policy' in September 2011, aimed at facilitating the transition toward a climate-resilient, low-carbon economy.

This ground-breaking policy included a commitment to "Integrate hazard vulnerability and risk assessments into development planning processes and utilize environmental impact assessments (EIAs) to assist with decision making".

In November 2021, the Cayman Islands Government began work with partners to deliver a Climate Change Risk Assessment (CCRA) as a critical first step in the process of reviewing and updating the draft National Climate Change Policy.

Funded through the UK's Conflict, Stability and Security Fund and the Governor's Office, the risk assessment was undertaken by the UK Centre for Environment, Fisheries and Aquaculture Science (Cefas) and the UK Centre for Ecology & Hydrology (UKCEH).

The risk assessment methodology used in the present analysis was informed by protocols developed for the United Kingdom Climate Change Risk Assessment (CCRA). The impacts on the finance services sector (e.g. banking and insurance) were not directly considered.

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# HIGHLIGHTS

Cefas and UKCEH drafted a comprehensive 'Evidence Report', drawing together knowledge of how climate change is impacting the islands or is expected to in the future. From this, a 'long list' of risks and opportunities was generated. At a workshop for local and regional experts in May 2022, these risks were scored in terms of proximity, magnitude and confidence.

Fifty risks were evaluated, of which eighteen are considered severe. Risks were scored separately for each of the three islands (Grand Cayman, Little Cayman, Cayman Brac) and then overall for the Cayman Islands.

In many cases the only evidence available about past or present climate change impacts in the Cayman Islands relates to observations made following the passage of Hurricane Ivan in September 2004. For 12 of the 38 topics featured in the evidence report, it was judged that only 'limited evidence' was available.

Nine of the 18 most severe climate change risks identified for the Cayman Islands comprised threats to biodiversity and natural habitats, and nine on society, infrastructure and buildings.

The three highest rated climate change risks (in terms of proximity and magnitude) to the Cayman Islands were: increased frequency and severity of coral bleaching and coral disease outbreaks; decline of coral reef structure and integrity; and disruption of turtle distribution and population dynamics.

Differences in risk profiles exist between the three islands. For example, risks to agriculture were rated higher in Grand Cayman compared to either of the Sister Islands (Little Cayman and Cayman Brac).

Some benefits are identified, including a potential decrease in mosquito populations and associated illnesses (e.g. zika, dengue and chikungunya), as a result of increased aridity and reduced precipitation. Certain strains of harmful algae that are associated with ciguatera fish poisoning (CFP) might also become less prevalent.

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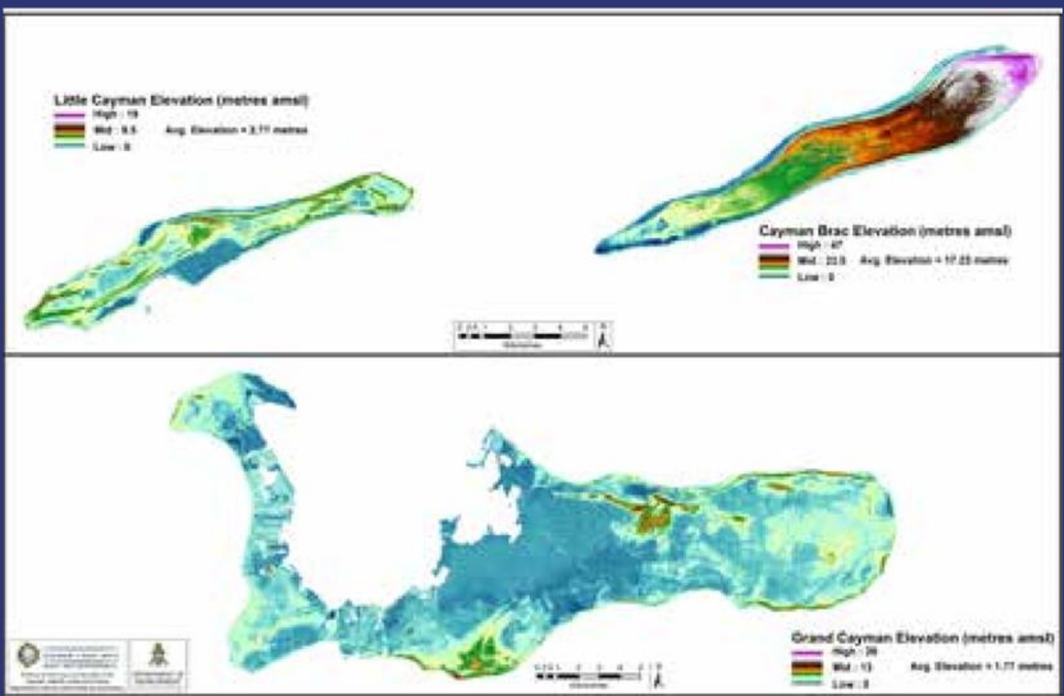
# THE CAYMAN ISLANDS – CONTEXT AND GEOGRAPHY

Grand Cayman (at 196 km²) comprises 76% of the territory's entire land mass. The elevation ranges from sea level to 18 m on the North Side's Mastic Trail.

The two "sister islands", Cayman Brac and Little Cayman, are located 120 km east north-east of Grand Cayman and have areas of 38 and 28.5 km² respectively. All three islands are mostly flat and were formed by coral accretion on top of submerged peaks. One notable exception to this is 'The Bluff' on Cayman Brac's eastern part, which rises to 43 m above sea level; the highest point on the islands.

Rather than considering the Cayman Islands as a 'small island state' it might be more accurate to view it as a 'large ocean state', recognising the central role that the ocean plays in Cayman Island's development. The Exclusive Economic Zone, though not yet agreed with all neighbouring states, covers 119,023 km², and as such exceeds the total land area by 450 times.




Elevation of the Cayman Islands (Lands & Survey Department, map produced by Department of Environment, 2022)

## IMPORTANT PHYSICAL CLIMATE CHANGE IMPACTS

The physical climate change impacts affecting the Cayman Islands are listed here. The impacts to biodiversity and society are evaluated in this risk assessment.

- Changes in storms, cyclones, winds, waves and storm surges.
- Sea-level rise
- Changes in ocean circulation
- Increasing air and sea temperature (including humidity)
- Changes in freshwater input
- Increasing coastal erosion
- Ocean acidification (declining pH)
- Decreasing dissolved oxygen (of seawater)
- Changes in salinity

• Average annual air temperatures have increased by ~2.2 °C over the past 40 years in the Cayman Islands.

• Historical records indicate that there is considerable variation in the rate of Sea Level Rise (SLR) throughout the Caribbean. Tide gauge data for South Sound (near George Town) suggest a rising trend of around 1.76 mm per year between 1972 and 1996 with accelerating future SLR projections of 0.29 to 0.32 metres by the 2050s relative to 1986-2005.

• There is strong evidence for an increase in the frequency and intensity of tropical cyclones (hurricanes) since the 1970s in the North Atlantic. Projections suggest that hurricane frequency will not increase significantly in the future, however it is more likely than not, that strong hurricanes will become more commonplace in the Caribbean.

• Rainfall data collected at the Owen Roberts International Airport suggest fewer, but more severe rain events in recent years. Global Climate Models suggest little change in average annual rainfall for the Cayman Islands through to the 2080s, but a drying trend toward the end of the century with 11% less total rainfall per year projected under the most severe climate change scenario.

• Atmospheric carbon dioxide ($CO_2$) concentrations have increased by 42% since the onset of the industrial revolution, and declines in surface ocean pH are already detectable and accelerating, including in the Caribbean.

# CLIMATE CHANGE RISK ASSESSMENT (METHODOLOGY)

Fifty discrete risks were identified in the evidence review. Twenty-two risks relate to biodiversity and habitats, and twenty-eight risks relate to the economy and society. Many of the risks are highly relevant to all three islands, some are more relevant to one island than others (e.g. 'shortage of water for agriculture and irrigation' which is 'high' for Grand Cayman, but 'low' for Little Cayman where very little agriculture is practised). Risks are based on the current state, rather than any desire to increase activity in any sector.

A panel of invited local and regional experts was convened on 25-26 May 2022 to score the risks in terms of 'proximity' and 'magnitude' (collectively and separately for each of the three islands Grand Cayman, Little Cayman and Cayman Brac).

For proximity, climate change risks or impacts thought to be occurring already scored '4', within the next 20 years '3', within next 50 years '2', whereas risks in the more distant future scored '1'.

Magnitude scores were based on the perceived significance and level of consequences. Magnitude levels were distinguished on the basis of how severely people might be affected by each risk (1000s affected to 1000s harmed or 100s fatalities), the level of economic losses anticipated (<1.5 million to >150 million dollars for a single event or per year), or the spatial area of habitat affected (0.5 $km^2$ to 50 $km^2$ lost/damaged), for example.

High magnitude risks were given a score of '3', medium scale risks were assigned a score of '2' and localised or low-level risks were given a score of '1'.

The formula used to combine scores is:

$$100\times\left(\frac{Magnitude}{3}\right)\left(\frac{Proximity}{4}\right)$$

This means that the lowest possible score is 8.3 and highest possible score will be 100.  Scores above 67 were considered 'severe' which result from scores of 3 for both magnitude and proximity (score = 75), or 4 for proximity and 2 for magnitude (score = 67).

| Level of Agreement | | | |
|---|---|---|---|
| | High agreement<br>Limited evidence | High agreement<br>Medium evidence | High agreement<br>Robust evidence |
| | Medium agreement<br>Limited evidence | Medium agreement<br>Medium evidence | Medium agreement<br>Robust evidence |
| | Low agreement<br>Limited evidence | Low agreement<br>Medium evidence | Low agreement<br>Robust evidence |

Evidence (Amount, Quality, Consistency, Type)

High confidence
Medium confidence
Low confidence

As a guide to our understanding for each climate risk, all have been categorised in terms of the level of agreement among researchers, as well as the weight of evidence. An overall confidence score was assigned based on this categorisation, as used by the United Nations Intergovernmental Panel on Climate Change (IPCC).

Fifteen risks were scored has having high confidence, twenty-three were scored as having medium confidence and twelve were scored as low confidence.

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# 18 MOST SEVERE CLIMATE CHANGE RISKS TO THE CAYMAN ISLANDS

Fifty risks were evaluated, of which eighteen are identified as severe meaning high proximity and high magnitude. Risks were scored separately for each of the three main islands (Grand Cayman, Little Cayman, Cayman Brac) and overall for the Cayman Islands as a whole.

| RISK | OVERALL RISK SCORE | RISK CATEGORY | GRAND CAYMAN | LITTLE CAYMAN | CAYMAN BRAC | CONFIDENCE |
|---|---|---|---|---|---|---|
| Disruption of turtle distribution and population dynamics | 100 | SEVERE | 100 | 100 | 100 | MEDIUM |
| Increased frequency and severity of coral bleaching and coral disease outbreaks | 100 | SEVERE | 100 | 100 | 100 | HIGH |
| Decline of coral reef structure and integrity | 100 | SEVERE | 100 | 100 | 100 | HIGH |
| Damage & inundation to the sewerage system and release of waste-water | 75 | SEVERE | 100 | 50 | 50 | HIGH |
| Disruption to fossil fuel imports, power generation and distribution | 75 | SEVERE | 75 | 75 | 75 | MEDIUM |
| Impacts on communications infrastructure | 75 | SEVERE | 75 | 75 | 75 | MEDIUM |
| Disruption to ports and shipping traffic | 75 | SEVERE | 75 | 75 | 75 | MEDIUM |
| Damage to roads, airports and infrastructure | 75 | SEVERE | 75 | 75 | 75 | MEDIUM |
| Damage to coastal settlements and buildings | 75 | SEVERE | 75 | 75 | 75 | HIGH |
| Disruption & damage to the tourism sector (and related infrastructure) | 75 | SEVERE | 75 | 75 | 75 | MEDIUM |
| Loss of endemic species and sub-species as a result of habitat degradation (animals and plants) | 75 | SEVERE | 75 | 75 | 75 | MEDIUM |
| Loss and damage to mangroves | 75 | SEVERE | 75 | 75 | 50 | MEDIUM |
| Loss and damage to seagrass beds or change in seagrass distribution | 75 | SEVERE | 75 | 75 | 50 | LOW |
| Freshwater lens contraction and salinisation of surface and groundwaters | 75 | SEVERE | 75 | 75 | 75 | HIGH |
| Impact on forest, woodland and shrubland communities | 75 | SEVERE | 75 | 75 | 75 | LOW |
| Storm damage to arable and horticultural agriculture | 67 | SEVERE | 67 | 33 | 67 | HIGH |
| Decline in natural assets that underpin tourism | 67 | SEVERE | 67 | 67 | 67 | MEDIUM |
| Increases in the occurrence of Sargassum seaweed | 67 | SEVERE | 67 | 67 | 67 | LOW |

# THE THREE CLIMATE CHANGE RISKS IDENTIFIED BY LOCAL AND REGIONAL EXPERTS AS MOST 'SEVERE' FOR THE CAYMAN ISLANDS:

Disruption of turtle distribution and population dynamics

Decline of coral reef structure and integrity

Increased frequency and severity of coral bleaching and coral disease outbreaks

# SEVERE BIODIVERSITY RISKS

The nine severe biodiversity risks are described below. The physical climate change impacts generating each risk are shown, with the most important highlighted in red.

### DISRUPTION OF TURTLE DISTRIBUTION AND POPULATION DYNAMICS

Medium agreement, medium evidence.

Beach profile changes from past hurricanes have caused losses of loggerhead and green turtle nests. In the future, further beach erosion, flooding, temperature changes and impacts on food resources are all expected to affect turtle nesting and breeding patterns. Sand temperature affects the proportion of male to female turtles that hatch, which in turn affects future reproduction rates. Flooding affects the survival of turtle eggs and hatchlings, beach erosion reduces the areas available for turtles to breed, and changes to wider ecosystems may mean that there is less food available in the future

Courtesy of Mark Orr

### INCREASED FREQUENCY AND SEVERITY OF CORAL BLEACHING AND CORAL DISEASE OUTBREAKS

High agreement, robust evidence.

Rising sea temperatures have caused catastrophic increases in the frequency and magnitude of coral bleaching events, coral disease and death. Rising sea level, sea temperatures and ocean acidification are likely to increase the incidence of coral bleaching and disease. The combination of human and natural pressures on coral reefs could influence how resilient corals are to future climate change pressures. Corals in Little Cayman, where there are few human pressures, have been more resilient and show fewer impacts from rising temperatures compared with the other islands.

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DECLINE OF CORAL REEF STRUCTURE AND INTEGRITY

High agreement, robust evidence.

Past storms and hurricanes have caused severe damage to reefs and particularly shallow and fringing reefs. Reef structures have been damaged with soft corals and sponges also affected. Expected future changes to hurricane intensity are likely to increase damage to reef structures. Reef structures and integrity will also be affected by ocean acidification and an increase in coral death as a result of coral bleaching.

LOSS OF ENDEMIC SPECIES AND SUB-SPECIES AS A RESULT OF HABITAT DEGRADATION (ANIMALS AND PLANTS)

Low agreement, medium evidence.

Climate change is affecting endemic species throughout the islands. Hybridisation with invasive species is also a threat. Future climate change puts endemic species at risk because they typically have lower population sizes and their restricted ranges mean they are less able to disperse compared to more widespread species. The extent of climate impacts on endemic species (e.g. the emblematic Blue Iguana Cyclura lewisi  or the rare land snail Cerion nanus) will largely depend on the interaction with other human pressures, such as land use change.

LOSS AND DAMAGE TO MANGROVES

Medium agreement, robust evidence.

Mangrove cover has reduced around the islands, mainly due to human disturbance and development. Hurricanes have also caused retreat or dieback through occasional inundation, after which recovery can be slow. Hurricanes, sea level rise and storm surges could all damage mangrove forests in the future, exacerbating flooding of coastal infrastructure as the protection afforded by mangroves is lost or reduced.

LOSS AND DAMAGE TO SEAGRASS BEDS OR CHANGE IN SEAGRASS DISTRIBUTION

Low agreement, medium evidence.

Previous hurricanes have caused damage to seagrass beds across the Cayman Islands, and globally seagrass beds have contracted following heat waves. Increased intensity of storms in the future could cause further damage to seagrass beds and they may not be able to recover adequately between storms. Sea temperature and salinity changes, as well as sea level rise may all lead to loss or decline of seagrasses, but conversely rising carbon dioxide concentrations could increase seagrass growth rates and productivity.

## FRESHWATER LENS CONTRACTION AND SALINISATION OF SURFACE AND GROUNDWATERS

### High agreement, robust evidence.

The quality and extent of freshwater lenses and groundwater in the Cayman Islands are determined by the balance between rainfall and evaporation. In other Caribbean islands, reduced rainfall and sea level rise have led to lens contraction and salinisation (increased saltiness). Future sea level rise, storm surges, coastal flooding and changes to rainfall patterns could all cause salinisation and contraction of Cayman Island freshwater lenses.

## IMPACT ON FOREST, WOODLAND AND SHRUBLAND COMMUNITIES

### Medium agreement, limited evidence.

There is little current evidence of impacts from climate change to these habitats in the Cayman Islands, but around the world, there have been impacts from hurricanes, drought, wildfire and changing ground water levels. Changes to the intensity of storms are likely to affect habitats, and habitat loss might also occur as a result of rising sea levels and associated changes to ground water levels or salinity.

INCREASES IN THE OCCURRENCE OF SARGASSUM SEAWEED

Low agreement, limited evidence.

Recent mass strandings of Sargassum seaweed around the Islands are thought to be caused by a combination of climate change, oceanic upwelling changes in Africa and eutrophication in South America. Rafts of algae form in the open Atlantic and get carried by currents into the Caribbean. There is limited information available about how climate change may affect these influxes in the future.

Courtesy of DoE

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# SEVERE SOCIETAL RISKS

The nine severe societal risks are described below. The physical climate change impacts generating each risk are shown, with the most important highlighted in red.

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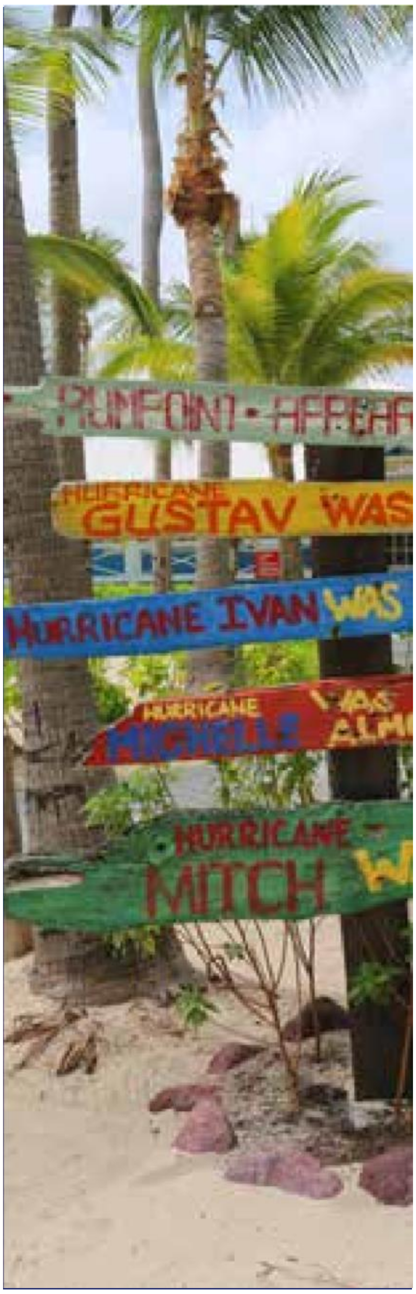
### DAMAGE TO, AND INUNDATION OF, THE SEWERAGE SYSTEM AND RELEASE OF WASTE-WATER

Medium agreement, robust evidence.

Changes in hurricane frequency and severity, in conjunction with sea level rise, pose a risk to wastewater treatment infrastructure, and in turn to public health and the environment, due to storm surge and surface water flooding from high rainfall events. Storm surges and episodes of high rainfall may exacerbate inland flooding through blockage of the outfalls of drainage systems with hurricane debris.

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### DISRUPTION TO FOSSIL FUEL IMPORTS, POWER GENERATION AND DISTRIBUTION (ENERGY SECTOR)

High agreement, robust evidence.

The Cayman Islands is heavily dependent on imported fossil fuels to meet its energy needs. Increases in storm frequency and intensity could hamper fuel deliveries, as well as causing damage to marine ports and infrastructure. Storms and hurricanes also have the potential to cause direct damage to power lines and other transmission infrastructure, as witnessed during Hurricane Ivan. Indirectly, heat waves can increase energy demand for cooling, which have resulted in disruptions to electrical supply in other countries.

## IMPACTS ON COMMUNICATIONS INFRASTRUCTURE

### Medium agreement, medium evidence.

The strong winds during Hurricane Ivan, combined with the intrusion of seawater from the associated storm surge caused extensive damage to telecommunications in the Cayman Islands, with losses estimated at CI$ 79.5 million. Some telecommunications lines on the islands are now buried underground. After Hurricane Paloma, landline services in Cayman Brac and Little Cayman were disrupted for two to three weeks

## DISRUPTION TO PORTS AND SHIPPING TRAFFIC

### Medium agreement, medium evidence

Disruption of maritime transport due to extreme weather events represents a significant risk to the import of goods and therefore food security in the islands and could significantly impact tourism services. Loss of working days due to the passage of storms, hurricanes or strong winds has become almost an annual occurrence since the 2000s. Any future increase in storminess is likely to mean that George Town port becomes inoperable more often. Disruption to regional major hubs such as Miami and Jamaica where most commodities dispatched to the Cayman

## DAMAGE TO ROADS, AIRPORTS AND INFRASTRUCTURE

### Medium agreement, limited evidence.

Coastal roads and airports on all three islands are highly vulnerable to flooding and storm surge, as well as impacts from category 4 and 5 hurricanes. Grand Cayman has a network of primary, secondary, unclassed, access and unpaved roads, which sustained substantial damages of over CI$146 million during Hurricane Ivan. A one metre rise in sea level would directly affect around 10% of roads on Grand Cayman, particularly those bordering the North Sound.

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DECLINE IN NATURAL ASSETS THAT UNDERPIN TOURISM

Medium agreement, medium evidence.

Impacts of future climate change on the tourism sector need to consider not just the direct damage to resorts and infrastructure, but also the degradation or loss of natural resources such as beaches, coral reefs and even fisheries that underpin tourism. There is evidence of beach retreat throughout the Cayman Islands, particularly in the area of Boggy Sand, Seven Mile Beach and Kaibo Beach (see below). Sea-level rise and changing wind patterns may further exacerbate beach erosion. A loss of fringing corals will increase vulnerability of beaches to erosion during strong wave events. Regular beach replenishment throughout the region may be needed in the future. Increases in the size or frequency of Sargassum seaweed blooms throughout the region reduces the appeal of Cayman's beaches.


Shoreline retreat in Kaibo Beach, Grand Cayman between 1994 and 2020. Map provided by Department of Environment.

## DAMAGE TO COASTAL SETTLEMENTS AND BUILDINGS

High agreement, robust evidence.

Coastal erosion and flooding from extreme weather events, combined with rising sea levels threaten critical public infrastructure and human settlements in the Cayman Islands. Hurricane Ivan in 2004 caused inundation of coastlines and heavy rainfall, resulting in over 70% of Grand Cayman becoming flooded and over 83% of the total housing stock on Grand Cayman damaged or destroyed. In the future, the worse-case scenario would see not just residential properties but also educational and religious buildings affected, including those located in West Bay, George Town, Bodden Town and Cayman Kai on Grand Cayman. Similarly, coastal and low-lying areas of Cayman Brac and Little Cayman will experience periodic inundation.

## DISRUPTION TO THE TOURISM SECTOR (AND RELATED INFRASTRUCTURE)

Medium agreement, medium evidence

Tourism is a particularly climate-sensitive industry and Caribbean islands are already experiencing beach erosion, more vector-borne diseases and property damage from hurricanes and storms. Increased threat of storms and resultant damage have led to substantial drops in visitor expenditure. The estimated cost of damages to the tourism sector from Hurricane Ivan were CI$ 281.9 million, including loss and damage to accommodation, boats and yachts. There was an additional CI$ 180,531 in losses to income from the lack of visitors during this period.

## STORM DAMAGE TO ARABLE AND HORTICULTURAL AGRICULTURE

Medium agreement, limited evidence.

Both agriculture and horticulture are vulnerable to extreme events such as droughts, storm surges and hurricanes, with 'return times' being of importance for recovery. Hurricane Ivan in 2004 destroyed 90-95% of crops on Grand Cayman, although some agricultural areas situated within the more protected eastern bluff of Cayman Brac were unaffected. Livestock was generally less affected but the poultry industry suffered severe damage to infrastructure. Future hurricane induced losses in the agriculture sector are expected to be large but vary across the region according to island size and characteristics.

Courtesy of DoE

# 32 MODERATE AND LOW-LEVEL CLIMATE CHANGE RISKS TO THE CAYMAN ISLANDS

In addition to the eighteen most severe risks to the Cayman Islands, a further thirty-two were scored and judged as moderate or low-level. Risks were scored separately for each of the three main islands (Grand Cayman, Little Cayman, Cayman Brac) and overall for the Cayman Islands as a whole.

| RISK | OVERALL RISK SCORE | RISK CATEGORY | GRAND CAYMAN | LITTLE CAYMAN | CAYMAN BRAC | CONFIDENCE |
|---|---|---|---|---|---|---|
| Losses in artisanal fisheries yeld, with impacts on food security and incomes | 50 | MODERATE | 50 | 50 | 50 | MEDIUM |
| Increasing heat and water stress for crops and forage plants | 50 | MODERATE | 50 | 25 | 50 | HIGH |
| Impacts on livestock | 50 | MODERATE | 50 | 25 | 50 | HIGH |
| Impacts on demand for, and supply of building materials | 50 | MODERATE | 50 | 50 | 33 | MEDIUM |
| Shortage of water for agriculture and irrigation | 50 | MODERATE | 50 | 17 | 50 | HIGH |
| Damage to inland settlements and buildings | 50 | MODERATE | 50 | 50 | 17 | HIGH |
| Damage to archaeological and cultural heritage sites as well as disruption of cultural events | 50 | MODERATE | 50 | 50 | 50 | MEDIUM |
| Heat & humidity related health impacts and mortality | 50 | MODERATE | 50 | 50 | 50 | MEDIUM |
| Increase in direct mortality & injury from hurricane/storm/flood events | 50 | MODERATE | 50 | 50 | 25 | HIGH |
| Loss of coastal protection function associated with removal of coral reefs, mangroves, sea grass and beaches | 50 | MODERATE | 50 | 50 | 50 | MEDIUM |
| Decline in carbon sequestration and storage function of vegetative habitats | 50 | MODERATE | 50 | 50 | 50 | LOW |
| Changes in the distribution and abundance of large offshore pelagic fish | 50 | MODERATE | 50 | 50 | 50 | MEDIUM |
| Disruption of seabird population dynamics | 50 | MODERATE | 50 | 50 | 50 | LOW |
| Changes to populations of resident and migratory bird species (terrestrial) | 50 | MODERATE | 50 | 50 | 50 | HIGH |
| Impacts on insect and vertebrate pollinators | 50 | MODERATE | 50 | 50 | 50 | LOW |
| Impacts on fresh (but brackish) water wetland vegetation and biodiversity | 50 | MODERATE | 50 | 50 | 50 | HIGH |
| Impact on (future) renewable energy production – mostly solar | 33 | MODERATE | 33 | 33 | 33 | LOW |
| Shortage of water for human consumption | 33 | MODERATE | 33 | 75 | 50 | MEDIUM |
| Damage and inundation of landfill sites, wash-out of contaminated wastes | 33 | MODERATE | 33 | 17 | 17 | MEDIUM |
| Changes to plankton productivity and plankton species composition | 33 | MODERATE | 33 | 33 | 33 | LOW |
| Changes in the distribution and abundance of reef, deep-slope, coastal fish and shellfish populations | 33 | MODERATE | 33 | 33 | 33 | MEDIUM |
| Changes in amphibian populations | 33 | MODERATE | 33 | 33 | 33 | HIGH |
| Impacts on the introduction and spread of non-native and invasive species (animals and plants) | 33 | MODERATE | 33 | 33 | 33 | LOW |
| Impact of (more frequent) wildfire events on forest, woodland and scrub communities | 33 | MODERATE | 33 | 33 | 33 | LOW |
| Impact on sport fisheries for large pelagic fish species | 25 | LOW | 25 | 25 | 25 | MEDIUM |
| Changes in mosquito populations and associated illnesses | 25 | LOW | 25 | 25 | 17 | MEDIUM |
| Changes in seafood associated illnesses and poisonings | 25 | LOW | 25 | 25 | 25 | MEDIUM |
| Changes to the occurrence and frequency of Harmful Algal Blooms (HABs) | 25 | LOW | 33 | 25 | 25 | MEDIUM |
| Increased disease transmission and occurrence (e.g. water-borne pathogens) | 17 | LOW | 17 | 17 | 17 | HIGH |
| Deterioration of air quality (indoor and outdoor) | 17 | LOW | 17 | 17 | 17 | MEDIUM |
| Change in the abundance and distribution of whales and dolphins | 17 | LOW | 17 | 17 | 17 | LOW |
| Impacts on deep-sea fish and invertebrate communities | 8 | LOW | 8 | 8 | 8 | LOW |

# VARIATION IN CLIMATE RISK PROFILE BETWEEN ISLANDS

Many of the risks are highly relevant to all three islands, but others were viewed as being more relevant to one of the islands rather than the others (e.g. 'Damage and inundation to the sewerage system and release of waste-water' was rated as 'high' in Grand Cayman where most of the population lives, but only 'medium' in Little Cayman and Cayman Brac).

Similarly, most risks relating to agriculture (e.g. storm damage to arable and horticultural agriculture; increasing heat and water stress for crops and forage plants; impacts on livestock; shortage of water for agriculture and irrigation) scored higher in Grand Cayman and Cayman Brac compared to Little Cayman where very little agriculture is practiced.

Notably, the climate change risks to mangroves or to seagrasses were considered lower in Cayman Brac compared to the other two islands, as mangrove forests and seagrasses beds are much less extensive on Cayman Brac.


The risk of damage to inland settlements and buildings as well as direct mortality and injury from hurricane/storm/flood events was scored lower for Cayman Brac due to the higher elevation of this island.

Shortage of water for human consumption scored higher for Little Cayman than was the case for the other two islands.

# WHAT ABOUT THE OPPORTUNITIES?

Although climate change was primarily viewed as a risk or threat to biodiversity and society in the Cayman Islands, the evidence review did highlight some instances where benefits and opportunities might present themselves.

Opportunities include a potential decrease in mosquito populations and associated illnesses (e.g. zika, dengue and chikungunya), as a result of increased aridity and reduced precipitation. However the role of extreme rainfall events, and changes in hurricane incidence or drought in the future remain highly uncertain.

The potential for greater salinisation of water bodies may favour populations of the nuisance Black Salt-Marsh mosquito (Aedes taeniorhynchus).

Future trajectories towards drier conditions suggest reduced incidence of Black Sigatoka Disease (a fungus) in bananas.

Certain strains of harmful algae that are associated with ciguatera fish poisoning (CFP) might become less prevalent.

Higher carbon dioxide concentrations in the atmosphere and warmer temperatures may increase photosynthesis, growth and flowering rates of seagrasses.

Invasive Sargassum seaweed could act as a natural 'sink' to offset carbon dioxide emissions to the atmosphere or could be used in biodigesters to generate bio-gas for energy production.

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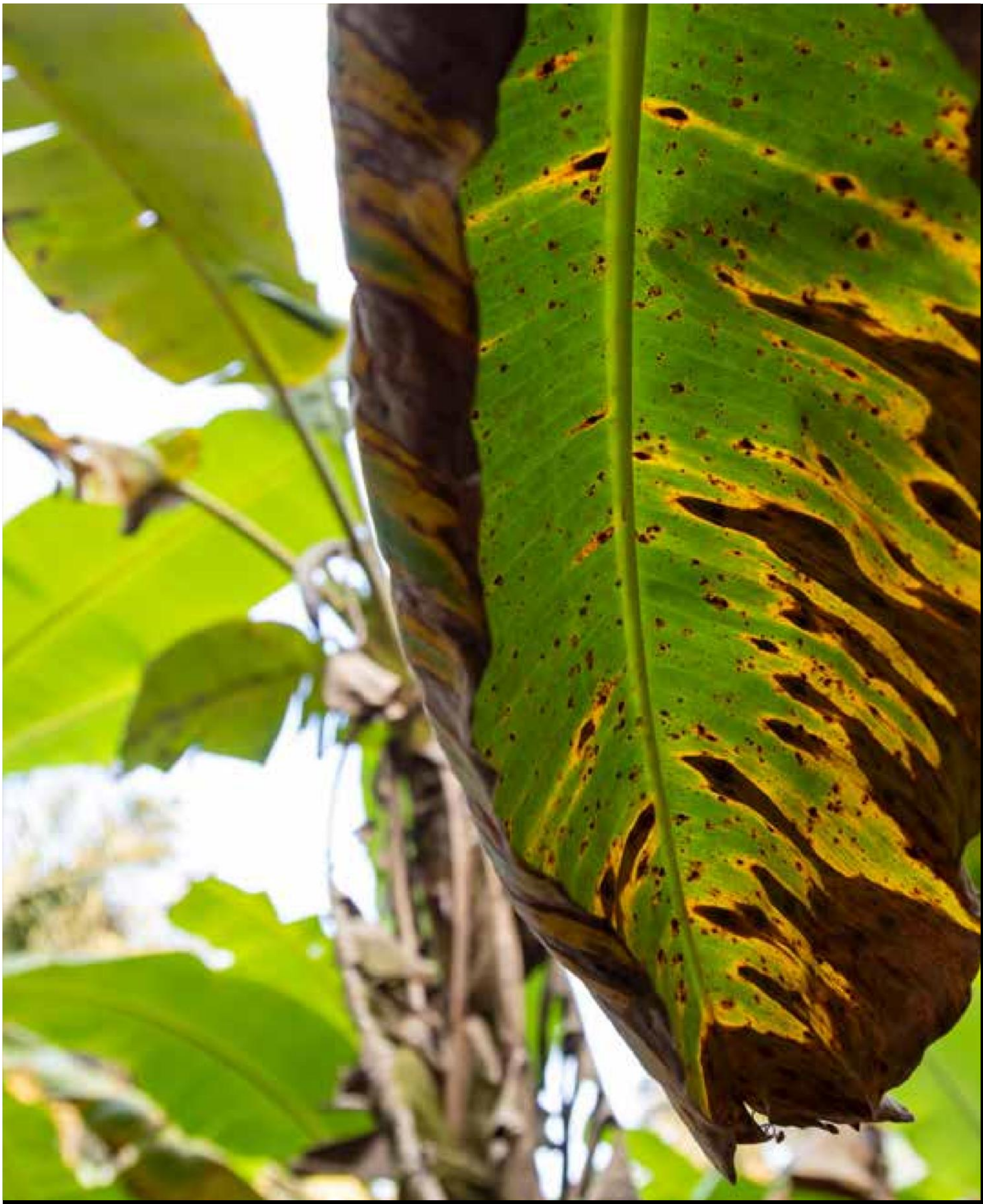
Incidence of Black Sigatoka Disease (a fungus) in bananas.



The risk assessment workshop with local and regional experts was undertaken in George Town, Grand Cayman from 25-26th May 2022.

## INVITED PARTICIPANTS WERE:

Caribbean Catastrophe Risk Insurance Facility (CCRIF)

Caribbean Community Climate Change Centre

Caribbean Utilities Company (CUC)

Cayman Brac Power & Light

Cayman Islands National Weather Service

Cayman Water Company

Central Caribbean Marine Institute

Central Planning Authority

Department of Agriculture

Department of Environment

Department of Environmental Health

Department of Planning

Department of Public Health

Department of Tourism

Development Control Board

Hazard Management Cayman Islands

JF Clarke Consulting Inc.

Lands & Survey Department

MFED - Risk Management Unit

Ministry of Planning, Agriculture, Housing & Infrastructure

Ministry of Sustainability & Climate Resiliency

Mosquito Research & Control Unit

National Conservation Council

National Roads Authority

National Trust for the Cayman Islands

Office of the Premier

Port Authority of the Cayman Islands

Public Works Department

Sister Islands District Administration

University College of the Cayman Islands

University of Southampton

Water Authority-Cayman

Hurricane Ivan was one of the most intense Atlantic hurricanes ever recorded. In 2004 it caused catastrophic damage to many Caribbean Islands, including the Cayman Islands. This is the Tarpon Lake, where the force of the wind uprooted many trees. Little Cayman, Cayman Islands.

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This summary report card was informed by a comprehensive Cayman Islands Climate Change Evidence Report (Pinnegar et al.) published by Cefas in October 2022.

As part of this project, in May 2022 the Ministry of Sustainability & Climate Resiliency facilitated a public meeting and anonymous, online questionnaire to evaluate and measure what Cayman Islands residents think and believe about climate change, and assess relevant behaviours. The survey closed on 24 June 2022 and received 1,085 responses. The survey report was published by the Ministry in August 2022.

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