Climate Change Impacts in the Caribbean

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Global mean surface temperatures have increased

Variations of the Earth’s surface temperature for...

Departures in temperature in °C (from the 1961-1990 average)

**the past 140 years (global)**

Departures in temperature in °C (from the 1961-1990 average)

**the past 1000 years (Northern Hemisphere)**
Sea Levels have risen

Relative sea level over the last 300 years

- Amsterdam
- Brest
- Swinoujscie

Millimeters
+ 200
+ 100
0
- 100
- 200

Year:
1700 1750 1800 1850 1900 1950 2000
The Land and Oceans have warmed
Precipitation patterns have changed.
Weather-related economic damages have increased
The change in temperature resulting from the SRES emission scenarios is shown in the graph. The bars indicate the range of temperatures predicted by several models for the year 2100.
The projected sea level change

Scenarios
- A1B
- A1T
- A1FI
- A2
- B1
- B2

All SRES envelope including land-ice uncertainty

Bars show the range in 2100 produced by several models

The projected sea level change
Land areas are projected to warm more than the oceans with the greatest warming at high latitudes.

Annual mean temperature change, 2071 to 2100 relative to 1990: Global Average in 2085 = 3.1°C
Some areas are projected to become wetter, others drier with an overall increase projected.

Annual mean precipitation change: 2071 to 2100 Relative to 1990
More adverse than beneficial impacts on biological and socioeconomic systems are projected.
Climate in the 20th Century

- Average temperature increased by 1 degree Celsius
- Mean sea level increased by 2 mm per year
### Projections in 21st Century

<table>
<thead>
<tr>
<th></th>
<th>2010 - 2039</th>
<th>2040 - 2069</th>
<th>2070 - 2099</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temp increase (degrees Celsius)</strong></td>
<td>0.48 – 1.06</td>
<td>0.79 – 2.45</td>
<td>0.94 – 4.18</td>
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<tr>
<td><strong>Change in precipitation (%)</strong></td>
<td>-14.2 to +13.7</td>
<td>-36.3 to +34.2</td>
<td>-49.3 to +28.9</td>
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- Max & Min temps increasing, cold nights decreasing
- Consecutive dry days inc. while no. of heavy rainfall events inc.
- Sea level will rise by 5 mm per year
Impacts

- A 0.5 m rise in sea level will result in 38% of beach loss
- 1/3 of turtle nesting habitat will be lost
- Coral bleaching could become annual or bi-annual without an increase in coral tolerance of 0.2 to 1.0 degrees Celsius
- Sea surface temp – increased incidences of ciguatera in fish
- Forest mortality of 5.2% per annum
  - 7 times higher than non hurricane periods
Water Security:
- Salt water intrusion
- Less rainfall
- More evaporation
Water Supply

- San Pedro
  - Desalination plant
- Placencia
  - Piped across lagoon
- Belize City
  - Supply located 17 miles inland
  - During drought, pumping limited to high tide
  - Salt water intrusion?
Sea Level Rise

- Erosion
- Coastal flooding
- Inundation
- Saltwater intrusion
- Mangroves

- Tourist destinations
- Human settlements
- Water supply
- Agriculture
- Aquaculture
- Fisheries
AVVA Vulnerability Analysis

- Entire coastline videotaped and analyzed in 1995
- Sea level rise of 4, 30 and 50 cm.
- Time periods of 25, 50 and 100 yrs.
- Little impact in 25 yrs
- 50-100% of beaches lost in 100 yrs
cysticходит, что коралловые вымерзания события ожидают увеличиться.
Fisheries

Threatened:

- Loss of habitats
- Mangroves, reefs
- Species migrate
- Water quality changes
Yellow tuna
*Thunnus albacares*

Habitat becomes less favourable

+1°C
Dolphin fish

*Coryphaena hippurus*

Habitat becomes less favourable

+1°C
Green parrot fish
Sparisoma chrysopterum

Habitat becomes less favourable

+1°C
Yellow tail

Ocyurus chrysurus

Habitat becomes less favourable

Caricom Climate Change Centre
Food Security
Vulnerability Studies in Agriculture

- 1995
- DSSAT
- Beans, corn and rice
- 1-2°C rise in temp
- ± 10-20% change in precipitation
- Result: 10-20% decline in yields
Forestry Threatened:
Higher temperatures
Lower humidity
More forest fires
More pests and diseases
Forestry

- 1999-2000
- Pine bark beetle infestation
- 75% of pine forest destroyed
- High temperatures & high humidity
- Poor management
- Climate change signal?
- Impacts on timber industry and biodiversity
- Contributes to emissions
Loss of Biodiversity
The high priority diseases identified in the small island states.

- **Disease Identified:** malaria, dengue, diarrhea disease/typhoid, heat stress, skin diseases, acute respiratory infections, viral hepatitis, varicella (Chicken pox), meningococcal disease and asthma, toxins in fish and malnutrition.

- The possibility of dust-associated diseases with the **annual atmospheric transport of African dust across the Atlantic**, is unique to the Caribbean islands.

- In addition to weather and climate factors, social aspects such as culture and traditions are important in disease prevalence.

Variability and trend of average yearly UV incidence due to cloud cover and total ozone changes in Havana during the period 1979-1993

Average annual UV increased significantly in agreement with the trend of decrease in cloud cover. This results are consistent with the observed trends by satellite in the region during 1979-1998.
Limitations

- Resolution of models: 400 – 125 km.
- Small islands do not appear
- Projections are over water not land
- Very little work in downscaling
- Some climatic processes are not well understood (e.g. mid-summer drought)
- Insufficient information on sea surface temperature
- Less scientific literature available to IPCC to prepare 4th Assessment Report than the 3rd Assessment Report
Challenges

- Limited size, prone to natural hazards and external shocks enhance vulnerability
- Low adaptive capacity and high costs
- 50% of population live within 1.5 km of coastline
- International airports, roads, capitals on coast
- Stresses: terms of trade, impacts of globalization, financial crises, international conflicts, rising external debts, rapid population growth, rising poverty, political instability, unemployment, reduced social cohesion, widening gap between rich and poor
Requirements

- Downscaling of global climate models
- Vulnerability assessments using objective techniques
- Integrated assessment models required
  - Fisheries: spawning sites, migratory patterns, habitats at various life cycles, changes in sea temperature and water quality
- Scientific work published in peer reviewed literature
- National Climate Change Policies and Action Plans