Experts say rainfall may lessen drought

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National Oceanic and Atmospheric Administration
Confidence in climate change impacts

Marine ecosystems
Coastal erosion
Livelihoods, nutrition

Managing the risks: sea level rise in small islands

Risk Factors

- shore erosion
- saltwater intrusion
- coastal populations
- tourism economies

Risk Management/Adaptation

- early warning systems
- maintenance of drainage
- regional risk pooling
- relocation
- Smart infrastructure

Emergent risks—compound events and rapid transitions (NCA4, 2018) from droughts and heat waves to storms and floods... and back again
2017 Atlantic Hurricane Season: Twenty-two (22) of 29 Caribbean SIDS impacted:
4 were affected by 1 storm, 13 by two storms, 5 by three storms

Maria was the fourth storm in a month to undergo rapid intensification

Maria could lower Puerto Rican incomes by 21% over the next 15 years, undoing roughly 26 years of economic development (Hsiang 2017)........

"provided there are no other storm impacts in that period"
The 2013–16 Caribbean multiyear drought was most severe and extensive period of dry conditions in the Caribbean and Central America since at least 1950.

Appears to be related not only to El Niño–driven precipitation deficits, but also to temperature-driven increases in potential evapotranspiration.
The 2018 Caribbean 1.5 project reported that 2.0 degrees will result in even further significant changes (over 1.5) in regional climate which take the region closer to climates it has not experienced to date.

### Critical Transitions

<table>
<thead>
<tr>
<th>Present Climate</th>
<th>Trend</th>
<th>Implication</th>
<th>Feature</th>
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<tbody>
<tr>
<td></td>
<td>High temperatures</td>
<td>Emergence of a new climate regime</td>
<td>Unfamiliarity</td>
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<td>Variable Rain</td>
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<td>More intense storms</td>
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<th>Future Climate</th>
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<td>Drying trend</td>
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Globally networked risks: the Caribbean

World grain trade

Estimated Venezuelan Migrants 2015/17

The Caribbean Diaspora

- Emigration
- Circular Migration
- Chain Migration
- Transnationalism

Vulnerability - imported fuels – 95%

Existing
2030 percent needed

Tourism in the Caribbean

2006 International tourist arrivals per $1,000 in GDP

Caribbean economies
GDP per head, %

Above 15
15 to 7.5
7.5 to 5
5 to 3
Below 3

Sources: CIA, “The World Factbook” (2018), and World Bank (2018)

Figure 5.12

The macro-economic imbalances nexus
The illegal economy nexus
The water-food-energy nexus

Growth

Chronic disease

Extreme energy price volatility

Food security

Global imbalances and currency volatility

Hunger states

Organized crime

Globalization

Drug trade

Climate change

Infectious disease

Venezuelan Migrants 2015/17
3 Key Tipping Points: The Caribbean

### Ecosystem: Hurricanes, Floods & Droughts
- Coastal Populations
- 90% of Caribbean economies are in coastal areas
- Poor (Coastal) Infrastructure

### Transnational: Migration & Immigration
- Venezuelan Migration
- Inter-regional Displacement
- Strong Economic Relationship with U.S. (Remittance Flows)

### Political Instability: Regional Governance
- Government Corruption
- Lack of Economic Diversity
- High Level of Indebtedness (China) & FDI

### Risks and Vulnerabilities
- Vulnerable to Exploitation as a Transshipment Point for Trafficking Drugs, Guns, and Increasingly, People

**King, Goodman, Pulwarty, Risi (in progress)**
The Implementation Plan (IP) for the Regional Framework, defines the regional strategy for coping with Climate Change over the period 2011-2021

Approved by the 23rd Inter-Sessional Meeting of CARICOM Heads held in Suriname 8-9 March, 2012.
Climate Risk Management – Regional Network (NCA4, 2018)
The Consortium is a key regional mechanism to champion the design, development and delivery of tailored climate products and services in the agriculture and food security, disaster risk management, energy, health, tourism and water sectors.

Co-development of sector-specific climate indices

- Facilitates broader dialogue and sustained engagement with regional and national stakeholders;
- Facilitates the identification and sharing of textual and georeferenced sectoral datasets;
- Facilitates the identification and sharing climate-related impact data;
- Supports research that examines associations between climate and relevant sectoral productivity outcomes; and
- Promotes the dissemination of climate information.
<table>
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<th>Recent Events</th>
<th>Countries Affected</th>
<th>Payouts (US$)</th>
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<td>Tropical Cyclone Erika, August 2015</td>
<td>Dominica</td>
<td>2.4 million</td>
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<td>Tropical Cyclone Matthew, September 2016</td>
<td>Barbados, Haiti, Saint Lucia, St. Vincent &amp; the Grenadines</td>
<td>29.2 million</td>
</tr>
<tr>
<td>Tropical Cyclone Irma, September 2017</td>
<td>Anguilla, Antigua &amp; Barbuda, St. Kitts &amp; Nevis, Bahamas, Turks &amp; Caicos, Haiti</td>
<td>31 million</td>
</tr>
<tr>
<td>Tropical Cyclone Maria, September 2017</td>
<td>Dominica, Anguilla, Antigua &amp; Barbuda, St. Kitts &amp; Nevis, Turks &amp; Caicos, Barbados, St. Vincent &amp; the Grenadines, Saint Lucia</td>
<td>23.8 million</td>
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All payments made within 14 days

Total payouts since 2007: US$123.5 million to 12 member governments

Basis risk
CCRIF was not designed to cover all losses on the ground
Roadmaps: The Caribbean in 2050
Alternative futures

**RCP 2.6, 4.5, 6.0**
**SSP 2**

**COOL RUNNINGS**
- PPP, Moderate Growth,
- Individualism, Consumerism,
- Energy Mix

**RCP 4.5, 6.0, 8.5**
**SSP 3**

**HARDER THEY COME**
- High Debt Levels, Income Inequality, Obsolete Sectors,
- Environmental Degradation

**RCP 2.6, 4.5, 6.0, 8.5**
**SSP-**

**ISLANDS IN THE SUN**
- Renewable Energy, Regional coordination, Health and Wellness, Environment

**PIRATES OF THE CARIBBEAN**
- **Pathway 1**
- Global Economic Collapse, Arms & Narcotic Trade, Crime, Corruption, Poverty
- **Pathway 2**

**WILD CARD**
The Western Pacific
El Niño: Hazards, Food & Water Security

• Driest period on record from 2008-2012
• Hawaii is 99% groundwater dependent, and baseflows have declined over the past 100 years
• Declining size of fish in Pacific fisheries
• Record cyclone season in Hawaii in 2015
• Wildfire burns ~8000 acres of Hawaii every year for the past decade

(NCA4, 2018)
Threats to Lives, Livelihoods, and Cultures

“Mounting threats to food and water security, infrastructure, and public health and safety are expected to lead to increasing human migration from low to high elevation islands and continental sites, making it increasingly difficult for Islanders to sustain the region’s many unique customs, beliefs, and languages”

National Climate Assessment
Caribbean and Hawaii and Pacific Islands Chapters
2018
Some Lessons Drawn-if not, learned

What is learned?
By whom?
And, what do they do with the lessons?

Tinkering vs Innovation?
1. “Layering”- Working across the alignment continuum

**Informal alignment**
- Policy documents are developed independently
- Actors involved in the different policy processes share information
- Collaboration in implementation is on an ad-hoc basis

**Strategic alignment**
- Synergies identified in policy documents
- Formal coordination mechanisms established to facilitate alignment
- Joint initiatives implemented

**Systematic alignment**
- Shared vision for climate-resilient development across policy documents
- Systematic coordination across actors, sectors and levels of government
- Harmonized implementation strategies

**Institutional arrangements**

**Information sharing**

**Capacity development**

(NAP, 2018)
2. Governing climate risk assessment and management

Broadening the “Actor” Network

Ensure political authority and policy coherence

Develop a culture of partnerships (beyond 2-way)

Decentralize Step by step

Partners do not just share data— they also share Risks, opportunities and responsibilities

Accountability................................Efficiency

The final stages of collaborative problem solving are fragile

(GAR 2011)
3. Anticipation and Agility

When do things go “right”/at least “acceptably wrong” ….or

What has led to being “proactive”?

- Early warning and windows of opportunity
- Leadership and the public are engaged
- Existing social basis/pressure for securing the common good

“Bad ideas have windows too”- so what else is needed?

- A collaborative framework between research and management-
  multidisciplinary, context-based, problem-focused
- Individuals dedicated to championing the issue—
  science-policy entrepreneur(s)
We’re all in this together

I’m sure glad the hole isn’t in our end . . .

Thank You!
Capacity Building For Community Partners

• Apart from training of NMHSs...
• CariCOF Stakeholder Forum - Dry Season (agriculture and water); Wet Hurricane Season (DRM); 2016 strong health focus, 2017 Heat products
• Drought monitoring, management and planning
• Media – Dry Season CariCOF 2015; Special media event February 2016; Wet Season CariCOF 2017.
• Support from EWISACTs Consortium