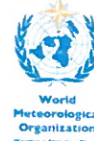


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The Caribbean Regional Climate Outlook Forum (CariCOF) Georgetown, Guyana November 27th – 30th, 2017

Report

Co-host:



Collaborators:



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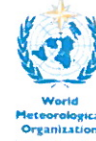


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1. Introduction

Since the 2012 Caribbean Climate Outlook Forum (CariCOF), the Caribbean Institute for Meteorology and Hydrology (CIMH) has been coordinating climate forecasting activities leading to a consistently growing body of climate forecasters contributing to the monthly production of consensus-based seasonal climate outlooks, with engagement of the user community that allows awareness-building within those sector communities. At the 2012 CariCOF, it was also agreed that the bi-annual hosting of such forums, roving across the region, just prior to the beginning of the wet and dry seasons in the Caribbean, be pursued.

In collaboration with the World Meteorological Organization (WMO), Environment and Climate Change Canada, The Investment Plan for the Caribbean Regional Track of the Pilot Program for Climate Change (PPCR), The Caribbean Development Bank (CDB), The Caribbean Catastrophe Risk Insurance Facility (CCRIF SPC), the International Research Institute for Climate and Society (IRI) of the Columbia University, the National Oceanic and Atmospheric Administration (NOAA) of the USA, the Caribbean Disaster Emergency Management Agency (CDEMA) and the Government of Guyana, the WMO Regional Climate Centre (RCC) for the Caribbean at the CIMH, delivered the 2017 Dry Season CariCOF from 27th – 30th November, 2017 in Georgetown, Guyana.

As has been customary for the dry season forum, emphasis was on the agriculture and water sectors. Training for meteorologists took place from 27th – 28th November with focus on (i) dry spell forecasting and products particularly supporting the agriculture sector (ii) the WMO's Climate Services Toolkit (<http://www.wmo.int/cst/>), as well as (iii) the potential Caribbean agenda and approach to sub-seasonal forecasting. The training was followed by the Stakeholder General Assembly on 29th - 30th November, 2017. Apart from the signature activity of CariCOF – the delivery of the seasonal forecast and discussions on their implications and impacts – there was some emphasis on sector climate information, and enhancement of sector related services. Further, after the devastation caused by two Category Five hurricanes in the Caribbean, emphasis was also placed on the now-ending 2017 hurricane season, its impacts and the relevance of weather and seasonal information for preparation and decision-making. Since many Caribbean countries have suffered from the 2014 to 2016 drought, the RCC lead a discussion on drought management and planning, with the view to energize the development of national drought mitigation plans across the region.

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1.2 Participants

Participants to the workshop were from National Meteorological and Hydrological Services (NMHSs) across the Caribbean, the CIMH, international trainers and stakeholders from the climate sensitive sectors (see [Appendix I](#)). The agenda can be viewed at https://rcc.cimh.edu.bb/files/2017/11/Draft-2017_dry-season_CariCOF_Forum_Agenda_17-11-2017.pdf.

2. Pre-CariCOF Training

Meteorologists and climatologists across the region spent the first two days in training to deliver a dry spell product for the stakeholders. These sessions were held in collaboration with experts from the IRI where they looked at adding context to the precipitation outlooks with the introduction of 7-day, 10-day, and 15-day dry spells. Participants were guided through exercises where they calculated 7-day, 10-day, and 15-day dry spells for their stations.

The predictability of sub-seasonal rainfall occurrence as well as the Climate Services Toolkit (CST) was also explored. One of the functions of the CST is to facilitate the production, communication, and application of climate information products. It comprises of (i) a data portal in the public domain for access to and analysis of observations, (ii) a data management system for quality control and simple management of data, (iii) climate monitoring tools for calculation of anomalies, percentiles, return periods, and (iv) software tools for conducting climate analyses, making predictions, and assessing projections. The intended audience for the CST is those of the National Meteorological and Hydrological Services, with the beneficiaries being the stakeholders of the five climate sensitive sectors (agriculture and food security, water, disaster risk management, energy, and health). Participants were invited to give their feedback of the CST via an online survey. The agenda for this training can be viewed at https://rcc.cimh.edu.bb/files/2017/11/Draft-2017_dry-season_CariCOF_TrainingWorkshop_Agenda_draft4_17-11-2017.pdf.

3. Opening Ceremony Addresses

The day commenced with the opening remarks and welcome by the Master of Ceremony, Mr Adrian Trotman (Chief of Applied Meteorology and Climatology, CIMH). He greeted The Honourable Noel Holder (Minister of Agriculture, Guyana), the representatives of various sponsoring agencies, including the Caribbean Development Bank, the University of the West Indies Mona Campus, The Coordinating Director of the Caribbean Meteorological Organization (CMO), the Acting Director of

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the Hydrometeorological Services of Guyana and other official guests, and of course all other stakeholders and meteorologists. Greetings were relayed on behalf of the staff and Principal of CIMH Dr. David Farrell (in his absence).

Mention was made of the history of the CariCOF meetings, highlighting that they were triggered by arguably the strongest El Niño back in 1997-1998 and its re-establishment later sparked by another drought event in 2009-2010. There are two CariCOF meetings held yearly coinciding with the commencement of the region's wet and dry season. The wet season CariCOF focuses on the Disaster Risk Management Sector whereas the dry season CariCOF focuses on the Agriculture and Water Sectors. Mr. Trotman emphasised that the primary focus of these meetings is to deliver forecasts for the upcoming season but first with relevant training for meteorologists and climatologists to aid them in the provision of early warning information to the various sectors.

3.1 Dr. Garvin Cummins (Hydrometeorological Service, Guyana)

Dr. Garvin Cummins, acting Director of the Hydromet Services, offered an official welcome to all attendees and expressed his hope that they all have an enjoyable stay. He alluded to the fact that the job of a Meteorologist or Hydrologist is not an easy one, but the information which they present is vitally important. With reference made to the use of certain forecasting tools, he noted that Meteorologists are rarely remembered when forecasts are accurate, but great pressure is placed upon them when inaccuracies in forecasts are made. He also commented that capacity building at the Guyana's Hydrometeorological Service is taking place with the help of the CIMH. He also noted that growth has taken place throughout the region due to CariCOF meetings, ensuring that all sectors benefit and Guyana's Hydrometeorological Service is willing to work together with CIMH to its advancement.

3.2 Dr. Yves Personna (Caribbean Development Bank, CDB)

In his address to the Forum, Dr. Personna stated that the Caribbean is prone to disasters because of its exposure and the millions of dollars in damage that have been incurred by the region as a result. The CDB has provided \$10 million USD in technical assistance towards climate work in the Caribbean. The CDB also partnered with CIMH to develop products and to support CariCOF in facilitating the exchange of information among the agriculture and water sectors.

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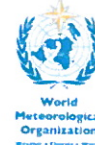


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3.3 Mr. Ainsley Henry (University of the West Indies, UWI Mona Campus; Pilot Program for Climate Resilience, PPCR)

Mr Ainsley Henry thanked the Government and people of Guyana for their hospitality in this venture. He stated that it was an honour and privilege to be able to represent the UWI Mona Campus and the PPCR. Mr. Henry applauded the work of Meteorological officials across the region as well as the CIMH and also gave his support through the PPCR (which would be fulfilled under Component II of the project).

3.4 Tyrone Sutherland (Caribbean Meteorological Council, CMO)

Mr Tyrone Sutherland highlighted the achievement of the CIMH, having recently being designated as a Regional Climate Centre (RCC). He stated that the institute has grown, increasing the number of outputs, thus demonstrating their ability to the WMO. He expressed his pleasure that a discussion on the recently concluded hurricane season was tabled on the CariCOF agenda.

3.5 The Honourable Noel Holder (Minister of Agriculture)

The Honourable Noel Holder welcomed all participants to the 2017 Dry Season CariCOF and gave a thorough description of his beautiful country. He lamented to the fact that climate change adaptation and disaster risk management is a pressing concern for the country of Guyana and thus preparation, awareness, response and mitigation is necessary to prevent loss and to reduce impacts. It is vital that measures to withstand the effects of climate change are enforced. Guyana's Hydrometeorological Service has seen its service transformed from just being a provider of information for aviation purposes but now also provides a myriad of information to fulfil the needs of other sectors (e.g. short, medium, and long-term forecasts; data for construction planning; water level monitoring; focal point for the Climate and Environmental Protocol). Information is power and if received at the right time could be very critical. The Honourable Noel Holder asked that experts be transformational to support adaptation and change. He suggests that this can be done by building and coaching teams in an effort to strengthen them.

4. Presentations

4.1 Dry Season Climatology of the Caribbean; Review of the 2016 Dry Season in the Caribbean (Wazita Scott, CIMH)

In her presentation Ms. Scott took participants through the processes involved in defining the Caribbean dry season. The season's drivers include the southward migration of the Inter-Tropical

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Convergent Zone as well as the Sub-Tropical High Pressure. Generally, the Caribbean dry season spans between the months of December to May, with the exception of the northern portions of the Guianas, where there are two wet (May-June-July and November-December-January) and two dry seasons (February-March-April and August-September-October). Comparisons between annual rainfall amounts and temperatures across the region were observed, with most variability seen in the rainfall.

In terms of drought, there were impacts across the Guianas during the 2014-2015 event. However, during the 2016-2017 dry season no major drought impacts were observed across the region. To monitor the drought situation across the region the CIMH has a variety of monitoring products and can be obtained at <http://rcc.cimh.edu.bb/>.

4.2 Dry Season Climate Outlook (Komalchand Dhiram, Guyana Hydrometeorological Service)

Mr. Dhiram presented the climate outlook and the summary is as follows:

December-January-February

- Comfortable temperatures throughout the Caribbean, though probably warmer than usual in the northwest for the cool season.
- Slower surface and soil water depletion than usual, reducing the intensity of the dry season.
- Reliable rains and enhanced long-term flooding potential in the coastal Guianas during December and January short rains
- Limited water storage related problem in agriculture, except in those few places already affected by drought.
- Extreme wet spells still possible during December in Belize, the Greater and Lesser Antilles, and during December and January in the ABC Islands and the coastal Guianas, with potential for flash flooding and landslides. Such spells become essentially absent by February (except for a small chance in the coastal Guianas).

March-April-May

- Gradual warming towards May with possible heat waves in Belize and Trinidad.
- Either wetter than usual or the usual amount of rainfall is likely depending on the location in the Caribbean.

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Stakeholders are encouraged to stay tuned as information is updated monthly.

4.3 Discussion – Expected Climate Impacts from the Forecast

The presentation of the climate outlook was immediately followed by a discussion segment where some participants made comments.

Elizabeth Johnson (Inter-American Institute for Cooperation on Agriculture, IICA) – It seems as though there is not going to be much of a break in the dry season and warmer temperatures will pose a challenge with respect to diseases.

Iwan Samoender (Ministry of Agriculture, Suriname) – Can we be more precise in saying how much wetter it will be?

Mr. Trotman reported that information indicating the range for above and below rainfall can be given and there is also the possibility for probabilities of certain rainfall and temperature thresholds, which would be illustrated in a later presentation.

Barry Innocent (Ministry of Agriculture, St. Lucia) – Mr. Innocent complements the team for the good work and is pleased with the good news from the forecast. He advocates that stakeholders apply the “Joseph’s Syndrome” (seven years of plenty followed by seven years of famine) and utilize water storage techniques. Since most climate change literature points to desalination Mr. Innocent advocates for a regional

Participants were then guided by facilitators to gather information about the possible impacts of the forecast and the decisions they would make in their sectors to reduce any impacts. The results of the discussions can be found in Appendix II. The questions were:

- 1) What are the implications of the forecasts for your sectors?
- 2) How would you respond to the forecast – would it prompt you do anything differently in your sectors?
- 3) What other climate information you wish you had that is seen as vital for your decision making for the next 6 months?

4.4 Session on Agriculture

In this session on agriculture a number of presentations were made, which promoted relevant climate information and services for the agriculture sector. The topics addressed included (i) Dry spell outlooks, (ii) Probability of Exceedance, (iii) the Participatory Integrated Climate Services for

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Agriculture (PICSA) programme, and (iv) the Resilient Environment and Agricultural Caribbean Habitats (REACH) project.

Dr. Cedric Van Meerbeeck (CIMH) made the delivery of the newest climate product – the Dry Spells Outlook. This product is tailor-made for the user to provide information on dry spell lengths and frequency. Once the stakeholder finds this product useful it can be made available on a monthly basis.

Mrs. Shontelle Stoute (CIMH) gave an example of another product which can be useful for agriculture. The probability of exceedence of a rainfall threshold can give the farmer an idea of his chance of receiving adequate rainfall for a good harvest, for example. The inputs for this product would involve a knowledge of crop water requirements and season of interest. Probabilities of critical threshold temperatures are also possible. Further, probabilities of exceedence are applicable outside the agriculture sector, with the potential to be linked to known thresholds in other sectors.

In the absence of the representative from the Caribbean Agriculture Research and Development Institute (CARDI), Dr. Cyril Roberts, Mrs. Lisa Kirton-Reed (CIMH) gave the overview of the PICSA project which utilizes climate information and involves farmer participation to enhance production. Well before the growing season, farmers are presented with, and discuss, the climatology of their region, as well as whether or not climate is changing. They take into consideration all that they do on their farms (how they make a living) and plan for the upcoming season. Just before the season they presented with the climate forecast; and decide if the information should make them change any of their farm and livelihood activities to mitigate any possible impacts the season may bring – e.g. they decide what they would plant, what resources they would need, who would be involved, and their projected profit.

Mr. Adrian Trotman (CIMH) introduced the REACH project, which is funded by the Ministry of Foreign Affairs and International Cooperation of Italy and executed by the Food and Agricultural Organisation of the United Nations. The programme is being implemented in St. Lucia and St. Vincent and the Grenadines by the CIMH, the Caribbean Disaster Emergency Management Agency (CDEMA), and the International Centre on Environmental Monitoring (Fondazione Centro Internazionale in Monitoraggio Ambientale, CIMA) and the University of Florence, Italy. The expected outcomes of the project include:

- Use of multipurpose agrometeorological networks and existing hubs for the development and communication of information to enhance resilient rural livelihoods,

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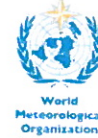


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- Enhanced access of smallholder farmers and local communities to knowledge and best practices on agriculture and natural resources management for hazard risk reduction,
- Knowledge sharing among regional institutions and producer organisations and enhanced communication that would support upscaling of viable agricultural DRM/NRM practices

4.5 Session on Hurricane Season 2017

This session was led by the Deputy Executive Director of the Caribbean Disaster Emergency Management Agency (CDEMA), Ms. Elizabeth Riley. It was geared at looking at the impacts of the 2017 hurricane season, the drivers behind the season, the experiences of the CDEMA Coordinating Unit, as well as experiences from residents who experienced the horrors of the systems that affected the region.

4.5.1 Introduction and Coordinating Unit Experiences (Ms. Elizabeth Riley, CDEMA)

Ms. Riley reported on the main hydro-meteorological events in the CDEMA Participating States for 2017. Nine states were impacted with four of these receiving catastrophic impacts. Thirty-seven fatalities were reported from Hurricanes Irma and Maria and the total population of the British Virgin Islands, Dominica, and Barbuda were affected. The impacts included disruption in communication, physical breaches of correctional facilities, disruption to the access of basic needs, break down in law and order, psychological impacts, and physical dislocation or population and migration. Following the passage of Hurricanes Irma and Maria, CDEMA activated its Regional Coordination Centre on September 6th, which conducted damage assessment and needs analysis, emergency response coordination, relief operations, and search and rescue. The CIMH's role in this activity included daily monitoring of weather systems to inform partner coordination meetings, CDEMA's operational scenario planning, deployment decision making, and ground operations and logistics. Going forward, the CDEMA will consider the following:

- Early warning and sectoral plans – what action does it trigger?
- How can we improve early warning for smaller events?
- Contingency arrangements for delivery of meteorological services – Plan required for this
- Documentation of experiences
- Opportunity of the Irma and Maria After Action Reviews
- Opportunity for Investment in
 - o Strengthening Early Warning Systems

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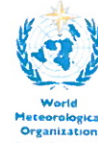


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- Resilience of Meteorological services

4.5.2 The Climate Context of the 2017 Season (Dr. Cedric Van Meerbeeck, CIMH)

Dr. Cedric Van Meerbeeck gave an overview of the climatology of the hurricane season and the main drivers of the season. He presented the behavior of these drivers so as to provide some reasoning behind the active 2017 hurricane season, which was ranked among the top 10. These drivers included:

- Sea surface temperatures, which rose above the normal levels across the Tropical Atlantic and the Caribbean Sea.
- Low vertical wind shear. Ideal conditions existed between July and mid-late October
- Vertical instability, which aided in the development of deep convective activity

The behavior of these drivers gave rise to high tropical cyclone formation probabilities, especially during August and September across the Tropical Atlantic. These ideal conditions played a role in the development of two destructive hurricanes making landfall in the Caribbean (Irma and Maria).

4.5.3 Impacts Related to the 2017 Hurricane Season (Mr. Shawn Boyce, CIMH)

Mr. Shawn Boyce gave a presentation highlighting the reported impacts relating to the 2017 hurricane season. These impacts were from as early as June 20th across portions of Trinidad and Tobago as a result of Tropical Storm Bret. There were reports of damage and loss to roofs, fallen trees and power lines, flooding and inaccessible areas. Then just one month later on July 19th the remnants of Tropical Storm Don caused flooding and mudslides across Trinidad. Tropical Storm Harvey on August 18th caused widespread power outages across Barbados and the north of the island was affected by flooding. What one would call “monsters”, Hurricanes Irma and Maria ripped across land masses causing havoc on September 10th and 28th respectively. Hurricane Irma claimed one life in Barbuda, destroyed 90 per cent of the electricity infrastructure, 99 per cent damage of the building structure, and total evacuation of the population. One fatality was reported also in Anguilla with widespread damage while four fatalities were reported in the British Virgin Islands and widespread damage as well. Hurricane Maria claimed twenty-seven lives in Dominica, destroyed 100 per cent of its agriculture, damaged electricity infrastructure and compromised the road network.

According to the US Climate Change Program, tropical cyclone projected trends could see increasing wind speeds and core rainfall rates, as a response to human-induced warming. With

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respect to floods and droughts, the World Wildlife Fund projects that climate change would lead to increasing frequency and severity of these events. The Caribbean Community Climate Change Centre reports that if the Caribbean remains inactive the cost of its inaction would total \$10.7 billion USD annually by 2025 and \$22 billion USD by 2050.

4.5.4 Experiences from the Tourism Sector (Kennedy Pemberton, Caribbean Tourism Organisation, CTO)

With the Caribbean region known as the destination for sun, sea, and sand, the recent passages of Hurricanes has placed challenges to the Tourism sector. Mr. Kennedy Pemberton, Sustainable Tourism Consultant of the CTO stated that there has been marketplace confusion as many have the notion that the Caribbean is a single place destination rather than several territories. Some news headlines made statements such as “Devastated – Caribbean wrecked by destructive power of Hurricane Irma”. Mr. Pemberton highlighted that even though some territories were affected by the weather events, there were still more destinations under the mandate of the CTO that were open for business.

In the territories impacted the affects were:

- Restricted visitor access as destinations were inaccessible due to damage to air and sea ports
- Dwindling supply assets. Cruise liners had been redeployed, accommodations closed, and major tourism products were lost (educational tourism and nature products)

4.6 Session on Early Warning Systems Across Climate TimeScales (EWISACTs)

This session, facilitated by Dr. Roche Mahon (CIMH), presented the participants with an overview of the EWISACTs portfolio and its progress to date. The provision of sector-specific climate information is useful as it provides early warning of potential impacting climatic events. Thus, the EWISACTs programme has established a framework for the provision of climate monitoring and forecasting information on a range of timescales. The first activity under sectoral EWISACTs programme began with a survey of the users of climate information in an effort to understand their needs and their usage of existing products. At present, the CIMH provides a range of technical products to support climate risk management, which are utilized by various stakeholders. A first draft of a roadmap for the future of sectoral EWISACTs was also presented to the participants

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Following the presentation, break-out group sessions were then facilitated to assess and make suggestions to the enhancement of the sectoral EWISACTs Outputs and Activities. Discussions questions were:

- Roadmap goal:
 - o Is the 10 year goal of “Increased climate resilience of sectoral infrastructure, activities and outcomes” appropriate?
 - o Do you have any suggestions for improving how the Goal is framed?
- Ultimate and Intermediate outcomes
 - o What are sectoral practitioners expecting to get from an investment into a sectoral climate services program?
 - o Do the Ultimate and Intermediate Outcomes reflect your expectations? (i.e. are they appropriate?)
 - o Are these really the only required Ultimate and Intermediate Outcomes to reach the 10 year long-term goal? Are there any missing components or sub-components?

4.7 Session on Drought Management Planning

A session on drought management and planning was facilitated by Mr. Adrian Trotman in an effort to see the implementation of drought management plans and policies, which would enable response to drought information. He gave an example of a Terms of Reference (TOR) for a national drought management committee from St. Kitts and Nevis, reporting that the TOR was sent to the Permanent Secretary responsible for meteorology to take to Cabinet for ratification approval. Mention was also made of the structure of the Barbados Water Authority’s Drought Management Plan with various stages for response action based on the severity of impacts during drought.

With the establishment of national drought management committees being the first step, countries should go one step further in their drought management planning by developing national drought mitigation plans. Some countries are currently in the process of developing such plans, but have indicated difficulty in determining how the various monitoring and outlook products using the Standardised Precipitation Index (SPI) can be to trigger actions and movement from severity stage to severity stage. Mr. Trotman presented two examples as to the guidance that can be provided to (i) agriculturists and (ii) national drought committees that would be tasked with moving the countries alert levels from stage to stage or declaring national droughts. The breakout groups were then tasked with the following ([responses in Appendix III](#)):

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- Review the maps from the 2014 to 2016 drought – SPI monitoring, Drought Outlooks identifying parts of the Caribbean going through agricultural and hydrological drought at the various times.
- Relate the severity/intensity of drought to the examples of impacts in the countries
- Would the two tables have assisted, in your opinion, provided the necessary guidance in responding to the drought conditions in the last drought episode or even support the declaration of an agricultural or national (sub-national) drought?
- Would this generic guidance table be useful in supporting the further development of a drought risk management plan that needs to suggest what actions are taken, and by whom with the onset of, or during the evolution of drought conditions?
- What would you change in the tables?

5. The Way Forward

In his closing remarks Mr. Trotman (CIMH) indicated the uncertainty of more CariCOFs due to funding but hopes that this would not be the final farewell. The CIMH will continue to seek financial support of these sessions. He is enthusiastic in seeing sub-seasonal forecasting become a part of the products produced by the CariCOF team as the sub-seasonal forecasting will influence a different type of decision making.

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Appendix I: Participant List

Country/Organisation	Last Name	First Name	Country/Organisation	Last Name	First Name
Agriculture – St. Kitts	Berry	Jeffery	CIMH	van Meerbeeck	Cedric
Anguilla – Met. Service	Jennings	Jeffrey	CIMH	Stoute	Shontelle
Antigua – Agriculture	Freeland	Marcelle	CIMH	Kirton-Reed	Lisa
Antigua – Met. Service	Paige	Orvin	CIMH	Scott	Wazita
Antigua Public Utilities Authority	Yearwood	Veronica	CIMH	Mahon	Roche
Aruba – Met. Service	Irausquin	Lothar	CIMH	Applewhaite	Andrea
Bahamas – Met. Service	King	Arnold	CIMH	Boyce	Shawn
Barbados – Met. Service	Blenman	Rosalind	Caribbean Media Corp.	Chance	Kenton
Belize – Met. Service	Smith	Michelle	Caribbean Met. Org.	Sutherland	Tyrone
Caribbean Farmer's Network	Greene	Jethro	Jamaica – Coffee Board	McCook	Gusland
CARDI	Hall-Hanson	Rasheeda	Caribbean New Media Group	Wallace	Ean
CARICOM	Singh	Amrikah	CTO	Pemberton	Kennedy
CARICOM Energy	Gardner	Devon	Cuba – Met. Service	Hernandez-Sosa	Marieta
Caribbean Public Health Agency	Clauzel	Shermaine	St. Vincent – Central Water and Sewerage Authority	Ballantyne	Danroy
Cayman Islands – Met. Service	Porter	Avalon	Dominican Rep. – Met. Service	Ozoria	Maria
Caribbean Community Climate Change Centre	Jones	Albert	Guyana – HydroMet	Zarzuela	Donessa
Caribbean Development Bank	Personna	Yves	Guyana – HydroMet	David	Komalchand
CDEMA	Riley	Elizabeth	Guyana – Energy	Dhiram	Eulene
CIMH	Trotman	Adrian		Watson	

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Country/Organisation	Last Name	First Name
Guyana – Environment	Small	Michael
Food and Agriculture Org.	Duncan	Martina
Grenada – Met. Service	Miller	Trisha
Guyana School of Agri.	Nurse	Osbert
Guyana Water Inc.	Daniels	Marlon
Haiti – Met. Service	Victor	Roudolph
Inter-American Institute for Cooperation on Agriculture	Joseph	Jermaine
Inter-American Institute for Cooperation on Agriculture	Johnson	Elizabeth
Jamaica – Met. Service	Brown	Glenroy
Jamaica – Ministry of Agri.	Webb	Francine
Guyana – Ministry of Health	Liverpool	Esther
Barbados – Ministry of Agri.	Chandler	Mark
Grenada – Ministry of Agriculture	Thomas	Daryl
NOAA – Climate Prediction Centre	Diouf	Sarah
Pilot Program for Climate Resilience	Henry	Ainsley
St. Kitts – Water	Greenaway	Shawn
St. Lucia – Agri.	Innocent	Barry
St. Kitts – Met. Service	Barry	Gassano

Organisation	Last Name	First Name
St. Lucia – Met. Service	Francis	Eugenie
St. Vincent – Met. Service	McDonald	Joan
Suriname – Agriculture	Samoender	Iwan
Suriname – Water	Ligeon	Carolien
Suriname – Met. Service	Mitro	Sukarni
Sustainable Development	Hall	Clayton
St. Vincent – Agri.	Browne	Karomo
Turks and Caicos	Henfield	Tiffany
Trinidad – Met. Service	Kerr	Kenneth
University of Guyana	Hamer	Seon
USA	Mason	Simon
UWI (Mona)	Buckland	Sarah
St. Lucia – Water Resource Management Agency	Mathurin	Junior

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Appendix II: Break-out Group Reports

Agriculture

Implications of the Forecasts

Positive

- Opportunity for increased production
- Water harvesting opportunity; management techniques good for farmers.
- Opportunity to implement climate smart techniques (Mulching, pest management, etc.)
- Implications for flowering
 - Should have a bumper crop, as lower temperatures favour pollen viability – great avocado crop. However, some citrus crops need a clear break; they need some sun to get a good citrus fruit set, so some crops depending on where the number of dry spells and how long it will be in between, should see a bumper crop, including for mangoes.

Negative

- In terms of the cooler temperatures
 - Two major fungal diseases (cocoa and coffee) – forecast will make it worse. Spores especially Coffee Leaf Rust (like it wet and cool) so the potential for epidemics will increase for the disease.
 - Cocoa – frosty rotting in Jamaica. Really an issue in terms of this disease spreading as it needs moisture
 - Implications for short term crops – bacterial leaf diseases, water moles, greater problem in seed beds, damping.
 - Insect pests increase with more rain.
- Extreme wet spells – water logging.
- In case of Guyana, which is below sea level, there is still a lot to be done with respect to drainage and irrigation
- Extreme rainfall – flash flooding to farming areas – Guyana, especially those with cash crops and cattle, poultry, and other agronomic activities.
 - Hydromet. Service already sent out warnings about the expected and advised cattle farmers, etc. and there was clearing the canals around farming areas – Guyana

Response to the Outlook

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- Sanitary procedures for seed trays must be enforced to ensure that these spores or mould diseases are reduced.
- More greenhouses for lessening pests and diseases; reduce water logging
- Most vegetable crops are set in seed trays so these trays should be cleaned with a sanitizing solution to be sure that this procedure is done properly at this time
- Strategic planning for drainage – Guyana
- Livestock sector– animals should be removed and feed and fertilizer elevated in flood prone areas.
- Rain harvesting- farmers have drums, black tanks, have to speak to the issue of having those farmers cover the drums to decrease likelihood of mosquito born disease or have small fish to feed on mosquito larvae
- Especially for the Guyanese with potential flooding – what we can do for farmers is to recommend different types of crops that would tolerate more wet spells. Guyana's bulletin usually gives suggestions of crops suitable.
- Non-technical implication – if we are going to have a bumper crop there is an implication. If we streamline this – we will have to look for extra markets. If we have the bumper crop and have a situation with oversupply the next year will be a disincentive for farmers - management decision

Additional Information

- Influence of wind and wind speed in the latter time of the year when there is an increase in wind velocity and its effect on evapotranspiration rates
 - Response from Met. Team: Heat product incorporates wind with heat stress, but not modelling the wind, it is more challenging.
 - Wind is not clear – evading us – not much skill in forecasting for wind at seasonal timescales, e.g. wind impact on evapotranspiration, it is difficult to say more. However, historical information can be useful if we can get data with respect to the last few months of the year, if we have a few good records, we can compare the winds with the evaporation records.
- Question: Have we done any modelling of the rainy season and the dry season? If we capture so much percentage more of the rain that falls what impact can that have on our management and improvement? Water collection and management as a whole program will help us with climate mitigation and climate change. St. Vincent depends a lot on rain-fed agriculture and not irrigation. We are thinking of inputting irrigation for dasheen, a major export crop, we had situations where crop production decreased by 40%. Has any modelling been done, as we can have control over water management and harvesting, in terms of using that to mitigate against dry spells?
 - Don't think CIMH has done modelling in that respect.
 - Guyana is working on a water management plan and St. Lucia which will take that into consideration.
 - Need to push a climate smart business plan which will encapsulate all this.
- Wind data – forecasting

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- In terms of pests and diseases, we know from experience that there is a cycle with the emergence of pests, etc., this is another issue why we are pushing climate smart farming, with different cycles based on temperature, the behaviour of pests changes, e.g. over the last year and a half, some pests have been reported....but can a long term study be done?
- Also looking for specific crops/varieties needed at certain times – drought tolerant varieties. Some varieties of sweet potato may stand up better in semi-dry or semi-wet conditions.
- Drainage – looking if there is excess water – pushing for collaboration from all the agencies – collecting into one thing to show good results.
- Info regarding the rate of evapotranspiration. If we could have an idea of the rate of evapotranspiration, it would influence the type of drainage system we would put in.
- Issue of rainfall days – most agriculture is rain-fed. We would like to be able to determine to what extent a farmer should invest in an irrigation system. Need to know on average what is the period between rainfall days
 - We have that info – it is mapped.
 - Information on rainfall days, spells etc. can be utilized
 - Could there be an interactive part on the platform where you can pick out – put things together – mix and match and do that kind of analysis and decision-making? Have it on the site so we can put the information together?

Sector

Implications of Forecast				
	Rainfall	Wet days/spells	Flooding	Response
Health	Possible increase in food related illness eg. salmonella	Possible increase in Aedes aegypti/albopictus borne diseases such CHIKV, dengue and Zika	Possible increase Leptospirosis; injury as a result of flash flooding; increase in gastro-intestinal infections; filaria (Guyana)	Population awareness building and outreach; alert key decision-makers to stock up on medications, vector control

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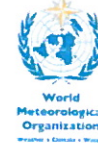


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				equipment etc.
Disaster Risk Management				Notification of national coordination mechanism for the period; reflection on existing flood management plans; prepositioning of assets re: response to flooding
Tourism	Outdoor activity disruptions in ABC Islands; increased travel time to destinations experiencing short wet season			Approach outdoor activities with caution in ABC Islands; opportunity to consider indoor activities; Tourism contingency planning advocated for air and sea ports, tourism suppliers (eg. Hotels) for all weather and climate

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				conditions
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	Temperature	Drought	Response
Health	Population heat stress not a major concern; respiratory illness may feature in Haiti	Water storage due to disruptions may facilitate conditions for increased mosquito proliferation; Food security and associated nutrition concerns in Haiti due to evolving drought; increase gastro-intestinal disease due to increase in micro-organisms in drying wells; possible increase in acute respiratory infections	Population awareness building and outreach; alert key decision-makers to stock up on medications, vector control equipment etc.
Disaster Risk Management		Bushfires a possibility in the Bahamas (which compounds respiratory illness)	Fire safety notifications to the public to be done by National Disaster Office in conjunction with the national fire service
Tourism	Less demand for cooling in hotels; greater appreciation for the natural environment (likely to	Possible water shortage in Haiti and the Bahamas	Water conservation measures needed in hotels

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	book eco-retreat type holidays)		
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Other Information Needed:

- Specific impacts forecasting for health, DRM and tourism sectors

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Appendix III: Drought Management Exercise

Agriculture and Water Group

- Existing frameworks can be utilized to determine where some actions would take place.
- Users thought that some capacity building on the various drought tools was necessary for the users.
- It was necessary to spend some more time on the tables so that it was clear how it was possible to move from one stage of drought to the other.
- It was easier to appreciate the guidance table for the agriculture sector than that for declaration – the declaration one needs more discussion.
- The meteorologists online from St. Kitts (one of the countries developing drought documents currently) indicated that the tables provided him with further food for thought in moving beyond the completed Terms of Reference document for the National Drought Management Committee to the establishment of the triggers for the drought risk mitigation plan.
- It was clear that further discussion was needed for the use of the drought products as triggers for specific actions, particularly declarations. But this could be the focus of a longer, more involved session at a future CariCOF.

Health, Disaster Risk Management and Tourism Group

- There is still need for a further understanding of how the drought monitor/outlook products can be used to support decision making. Some type of online course related to the potential use of the products could be developed to facilitate continuous professional development.
- Impact/Alert messaging needs to be country specific and sector specific. It was mentioned that currently under the Weather and Climate Ready Nations (WCRN) project impact, risk and response matrices are being developed for use by BMS and disaster management in Barbados for weather related hazards. This includes dissemination of information to stakeholders. Perhaps the same concept could be applied to ensure consistency.
- The need for a "no concern" declaration was discussed since it gave the impression that continued monitoring was not required. Perhaps this could be "no action". Again I would have suggested consistency with WCRN would be useful.

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