

The Caribbean Regional Climate Outlook Forum (CariCOF) Dry Season 2014-2015 Report

Keeping It Real?

St. John's Antigua and Barbuda

1-2 December 2014

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The Caribbean regional Climate Outlook Forum (CariCOF) was held at the Halcyon Cove Hotel, St. John's Antigua and Barbuda. This forum was attended by personnel from agriculture, health, water and disaster management, as well as personnel from regional Meteorological Services, Caribbean Meteorological Organization, International Research Institute for Climate and Society (IRI), media houses and the Caribbean Institute for Meteorology and Hydrology (CIMH). See [Appendix A](#) for list of participants. This meeting followed on the heels of a training workshop for meteorologists in forecasting techniques.

Welcome

Welcome remarks were given by the Hon. Edson Joseph and highlighted the reintroduction of the COF's in the region and the need to improve the communication of dry season outlook/forecasts to the stakeholders by the scientific community. He confirmed his government's support for this regional initiative.

Chairman, Mr. Adrian Trotman, indicated the importance for the region to have the upcoming drought monitoring and planning workshop, to be held in Barbados in January 2015, as the region recently experienced the worst drought in over 4-5 decades in the region during 2010. CDEMA has now made the monitoring and planning for drought in the region as one of its priorities.

¹ Caribbean Institute for Meteorology and Hydrology

² St. Vincent and the Grenadines Meteorological Service

³ St. Kitts Meteorological Service

⁴ Dominica Meteorological Service

Other welcoming remarks were given by Mr. Keithley Meade of the Antigua and Barbuda Meteorological Service, Christina Cairns of United States Agency for International Development (USAID, one of the key sponsors of this event, thanks to the generosity of the American People), Mr. Tyrone Sutherland of the Caribbean Meteorological Organization (CMO) and Mr. Garfield Barnwell from the Caribbean Community (CARICOM) Secretariat.

Presentations

The Caribbean Dry Season by Shontelle Stoute (CIMH)

Mrs Stoute highlighted that the dry season generally runs from December to May, but may vary across the region. For example, the Guianas have two dry seasons (approximately February to April and August/September to November). This is as a result of the migration of the Inter Tropical Convergence Zone (ITCZ).

Monthly rainfall totals also vary from country to country, however, in essence rainfall totals during dry season months are far below those of the wet season. Also, generally, the dry season coincides with the northern hemisphere winter, and is therefore associated with lower temperatures than during the wet season.

Mrs Stoute introduced the Standardized Precipitation Index (SPI) to the stakeholders, which can be used to monitor drought conditions. SPI is basically a representation of rainfall in units of standard deviation. Positive values indicate greater than median rainfall; negative values indicate less than median rainfall. The decreasing negative values indicate an increasing severity of meteorological drought. The forecast for January to March 2010 (Figure 1.a) was for a better than normal chance for below normal rainfall from Guyana in the south to Jamaica further to the west. The 3 month SPI map (Figure 1.b) showed that the region was indeed dry during this exceptionally dry period of the record Caribbean drought. Mrs Stoute also reported that the CariCOF also produces and SPI (drought) Outlook.

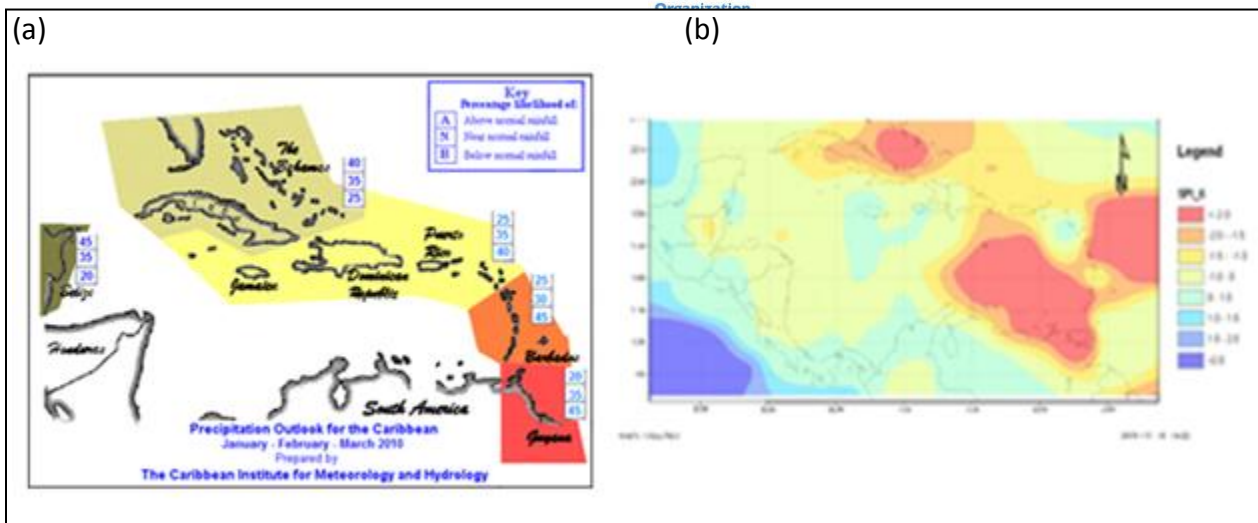


Figure 1: January-February-March 2010 rainfall outlook (a) and January-February-March 2010 SPI map (b)

In closing, Mrs Stoute showed several maps indicating the reoccurrence of drought events over several years for some Caribbean territories.

Questions/Comments:

- The representative from the Gleaner indicated that there is a need for the information provided by the climate sections to be translated into action by the various key sectors.
- The Chairman indicated that this was one of the main reasons for having the various stakeholders so that the need for a translation of action can be reiterated and supported by the key sectors and stakeholders.
- The definition for drought was asked but it was intimated that this will be clarified in a later session.

Dry Season Climate Outlook by Dale Destin (Antigua and Barbuda Meteorological Service) and Dr Cedric Van Meerbeeck (CIMH)

Rainfall and Temperature Outlooks (Dale Destin)

In his presentation, Mr Destin presented the rainfall and temperature outlooks for two time periods - December 2014 to February 2015, and March to May 2015. He also gave a review of the impacts of the current drought affecting his country. See [Appendix B](#) for outlook maps.

Rainfall Outlook

December 2014 to February 2015

- Normal to Above normal for the Eastern Caribbean (EC) and Guianas
- For the western Caribbean, better than average chance of below normal

March to May 2015 (Figure 3)

- Greatest likelihood of Above normal for Windward Islands and Barbados

Temperature Outlook

December 2014 to February 2015

- Normal to above normal temps expected across the entire region

In general, the Eastern Caribbean will most likely be wetter and warmer than normal, whereas the western Caribbean is most likely to be drier and warmer than normal for the period December 2014 to February 2015.

Drought Outlook (Dr Cedric Van Meerbeeck)

Dr Meerbeeck, as he presented the drought outlook for the region, indicated that drought is a seasonal problem for the Caribbean and therefore monitoring on a seasonal basis (and other timescales) is necessary. The meteorological/climatological definition given for drought is that drought is a rainfall deficit below normal for a particular place and period. The agricultural and hydrological sectors define drought based on their needs and the time they would be impacted by the deficits in rainfall.

CIMH not only monitors drought through the Caribbean Drought and Precipitation Monitoring Network (CDPMN), but supported by the CariCOF, will also focus on forecasting potential droughts and dry periods in the region.

The Drought Outlook for the hydrological year June 2014 to May 2015 suggested drought warnings for most of the region. However, the outlook for September 2014 to February 2015 shows a lesser severity of drought conditions for most of the region over this shorter term. Coming out of this short-term outlook, it was recommended that Cayman Islands, Haiti, Jamaica and the Eastern Caribbean conserve water.

Questions/Comments:

- Drought categories are conflicting to what is used for hurricane warnings. This was clarified that we are not just using intensity in the color coding of the alert levels.
- The drought timescales was a bit confusing but it was clarified that the impact to the various sectors will occur over different timescales.
- Have you done an analysis of how accurate the predictions will be as the response from weather forecasts is questionable as they are usually inaccurate?
 - The reliability and accuracy of the forecasts can be verified through different parameters in the tools.

- Agriculture representative from Dominica wants us to be specific about which type of drought it will be; i.e whether it will be a climatological or agricultural drought etc.
 - Dr Meerbeeck indicated that the end user has to first know which forecast they would need and indicated that we can only forecast for a minimum of 3 months and he expressed the need to have adequate number of datasets and sufficient time to provide a forecast with sufficient time to act.
- The Antigua and Barbuda agriculture representative questioned the accuracy of having Antigua and Barbuda under a drought watch/warning and not an alert although on the ground drought conditions have already being manifested.
 - Dr Meerbeeck indicated that although Antigua and Barbuda is experiencing various degree of drought depending on the sectors that we are anticipating that the accumulated impact over the next few months extending to the end of May that we should be under a drought watch. He emphasize that we are projecting how bad it will be and how certain we are of this happening.

Presentation-El Nino and Caribbean Climate by Tannecia Stephenson (Climate Studies Group Mona, University of the West Indies)

In her presentation Ms Stephenson, defined the terms El Niño and La Niña. El Niño is simply an unusual warming of the eastern tropical Pacific sea surface whereas the La Niña is the cooling of seas surface temperatures in the eastern tropical Pacific Ocean. The combination of these two phenomena is usually referred to the El Niño Southern Oscillation (ENSO) and takes place every 3 to 6 years. The intervening weak and moderate El Niño events do not typically bring a lot of disastrous consequences. The events of 1982/83 and 1997/98 were unusually strong, equaled historically only by events in the late 1800s. Really big events like 1982/83 and 1997/98 occur only a few times in a century.

Why does ENSO happen? It happens as a result of the shift in the intensity of the trade winds across the tropical Pacific Ocean. The impacts of an El Niño event across the region are as follows:

- Dry season drier in south Caribbean
- Late season drier in most of the Caribbean
- The year after an El Niño event the region would experience a wetter early wet season
- Decreased tropical storm activity through higher than normal wind shear

Questions/Comments:

- To what degree of certainty policy makers take the projections seriously?
 - Dr. Meerbeeck indicated that he is uncertain because of the communication barriers between us technocrats and policy-makers. Some policy makers were aware about the drought projections but the reasoning for the inaction

by the policy makers was questioned. The representative from the Jamaica Meteorological Services indicated that the public and policy makers were aware of the impending drought and some actions were taken but maybe not as effective as could have been.

- It was suggested that a drought management plan be instituted at a community level if there is to be greater efficiency in the actions taken.

CariCOF Theatre

CariCOF Theatre was a presentation of the CariCOF drought outlook for 2014/2015 in a news item format. Participants were made aware of the related impacts of a heat-wave such as forest fires, hypothermia, loss of revenue as a result of crops and livestock losses and the increased costs associated with managing the effects. Towards the end, emphasis was placed on taking adaptive measures in such an event to lessen the impacts.

Relating Climate Information (Simon Mason, IRI)

Mr Simon Mason from IRI presented on the Ready-Set-Go model which can be used to relate climate information according to various times scales. This was developed as seasonal forecasts do not provide specific information on where or when an event, whether floods or drought, may occur. During the 'Ready' stage the relevant sectors should begin monitoring mid-range and short range forecasts and taking preventative action in the event that of something occurring. During the 'Set' stage, shorter time scale forecast of up to a few weeks should be monitored. More specific local actions to reduce impact or to provide relief can be taken. During 'Go' more information of when and where the event will occur is given. More drastic action such as relocating persons can be taken.

Questions/Comments:

- A representative from the agricultural sector asked of real life examples on the use of Ready-Set-Go.
 - o Mr. Mason responded that none could be identified at this time except for a project between the FAO and WTO, while the representative from CCCCC suggested that the closest was what exists in St. Vincent for the hurricane season. Meanwhile, the Gleaner representative pointed to the fact that as a communication strategy, media houses would accept this format as it exists to disseminate to the public.

Breakout Groups

Participants were broken up into groups representing agriculture, water resources and a mixed group of other sectors (including disaster managers and media). They were asked to discuss their climate needs, their interpretation of the drought alert levels and actions that can be taken at the country and community levels. See [Appendix C](#) for a summary of presentations.

Caribbean Impacts Database and its integration into DEWETRA (Shelly-Ann Cox, CIMH)

Ms Cox began by highlighting the recent impacts across the region as a result of excessive rainfall (Trinidad and Tobago and Barbados) and drought (Antigua and Barbuda). She highlighted the benefits of such a platform:

- One could now have evidence-based information (no longer perceptions)
- Improved efficiency and effectiveness for planning, adaptation and mitigation
- Contributes to a reduction in vulnerability

The Climate impacts Database (CID) is an open-sourced, geospatial database with impacts of climate variability, tropical cyclones, heat waves (prospective). It is located on a central platform with inputs such as:

- Flood inventory from CIMH
- Caribbean Emergency Disaster Management Agency (CEDMA) disaster statistics database
- Those from disaster management agencies across the region

The CID has been developed for the four GFCS climate-sensitive sectors, namely; Water, Agriculture, Health and disaster Management. The rainfall impacts reporter is the baseline for the database as it was conceptualized to facilitate reports on a national level (via print and RSS feeds). However, the sectors must be the main source of input.

Ms Cox stated that the program is able to generate and export graphs. There is also a section which generates news from hash tags.

CID link with DEWETRA

DEWETRA is geospatial but real-time, having road networks etc. Thus it was proposed that DEWETRA be the platform for an Early Warning System (EWS). DEWETRA adds additional value as it is able to downscale for territories.

Break out Exercise

In this exercise participants used their cell phones in a simulation to tweet information and watch it being incorporated into the database.

Task:

You have been assigned by your ministries to report the impacts of a dryspell. The most cost effective way is to use twitter using #ercreport accompanied with pictures.

Questions / Comments:

- Mr. Mathurin (Saint Lucia): Would there be a reply for the tweets?
 - o Ms Cox: Yes. But you are encouraged to use the hash tag. Also include photos. There is a portal to validate tweets first before including them into the database.
- Mr. Trotman: Tweeting is not the only way to report impacts

- Ms Cox: One can also email, skype or telephone
- Mr. Destin (Antigua and Barbuda): What about Facebook? Can impacts be sent via this media?
 - Ms. Cox: Yes. As long as you use the hash tag.
- Sheryl Etienne-Le Blanc (St. Maarten): there is a concern about using the platform as an EWS as not all countries have DEWETRA.
 - Ms Cox: there is a separate portal for these countries which do not have DEWETRA. As long as impacts are archived you can still access via CID.
- What about whatsapp?
 - Ms. Cox: this is being explored

Presentation from Jenni Campbell (Jamaica Gleaner)

This is a very important conference. A lot has been learnt but also disappointed that more media personnel were not present. From a public perspective:

- The role of the media is to represent the voice of the public
- The media's mission is to prevent disaster by informing the people. When the people are informed they are able to prepare for the event.
- Predicting is important in any communication strategy

Ms Campbell also noted that the impact of drought is not immediate and there is a hope that water would always be available. There needs to be a prolonged system of communication. One consideration which should be taken is that the information be sector specific. In terms of preparation, it should be such as that with hurricanes where information is made available to the public by June 1st. This information could be in the form of a checklist.

Suggestions:

- It is important to have a list of terms and meanings
 - There can be spaces made available in print media for terms and definitions
- Have a list of frequently asked questions
- Vulnerability mapping is necessary
- With respect to drought categories, colors and actions to be taken need to be very clear and precise
 - Need to educate the people now as to what can be done, machinery available. Thus building trust with the people
- Have a press conference
 - What we have
 - What will come into play
 - Reliability
- Build trust
 - Remind the people of the last time we had a serious event and its outcomes. Have people who were impacted speak out so that all will be properly prepared in another event

- Publicize any national plans

Questions /Comments:

- Mr. Trotman: As the hurricane season approaches, education and awareness begins. Can it be done for the dry season as well? It may not be necessary to have a drought plan specifically, but maybe a dry season plan, reminding persons of water conservation etc.
- Mr. Trotter (Ministry of Agriculture, Dominica): CariCOF theatre is an excellent way to get the message across
 - Ms. Campbell: this is a wonderful tool. However, have the message at the beginning (i.e. the checklist for heat wave came at the end)
- Tannecia Stephenson (UWI Mona); context is also important (i.e. the amount of rainfall coming out of the wet season)
 - Mr. Trotman: Yes. It is also used as persistence for the drought outlook

Simulation Exercise

There was an island simulating exposure to hazards. The question was “How can we build a climate resilient community on small island developing states (SIDS)?” Participants were grouped to perform the following task:

1. Develop a decision support system to inform disaster reduction management and climate resilient planning practices.
2. Create a plan to build a comprehensive climate community
3. Identify key stakeholders

Refer to [Appendix D](#) for responses.

Additional Activities

CariCOF is also supported by the University of Arizona under the USAID/NOAA⁵ funded International Research and Applications Project’s (IRAP) Integrating Climate Information and Decision Processes for Regional Climate Resilience, that focused on exploring research-based approaches to⁶:

- Understanding the structure and functions of formal and informal networks for climate information production, communication and use,
- Assessing vulnerabilities of affected communities to impacts of climate variability and change,
- Assessing risks incurred by sectors impacted by climate variability and change and,
- Evaluating effectiveness of products and processes of the existing system of production, provision and use of climate information.

⁵ United States Agency for International Development/National Oceanic and Atmospheric Administration of the USA

⁶ Adapted from CariCOF Dry Season 2014-2015 Concept Note
(http://www.cimh.edu.bb/pdf/CariCOF_Dry_Season_2014-2015_Concept_Note.pdf)



Activities from IRAP begun with the wet season Climate Outlook Forum (COF) and continued into the dry season COF where the focus was on:

1. Contextualizing and Sharing Climate Information
2. Opportunities to Overcome Barriers
3. Creating a Climate Dashboard

Click [here](#) for a detailed summary of the IRAP activities.



Appendix A – Attendee List

Last Name	First Name	Country	Organisation
Applewhaite	Andrea	Barbados	CIMH
Bailey	Gregory	Antigua and Barbuda	Ministry of Agriculture
Ballantyne	Danroy	St. Vincent	CWSA
Barnwell	Garfield	Guyana	CARICOM
Blenman	Rosalind	Barbados	Met Office
Brereton	Leslie	Barbados	MOA
Brown	Glenroy	Jamaica	Met Office
Burke	Elmo	St. Kitts	Met Office
Cairns	Christina	Barbados	USAID
Campbell	Jenni	Jamaica	Gleaner
Canterbury	Donna	Guyana	GWJ
Cox	Shelley-Ann	Barbados	CIMH
Cumberbatch	Catherine	Belize	Met Office
Destin	Dale	Antigua and Barbuda	Met Office
Drakes	Gayle	Barbados	CDEMA
Edwards	Celia	Grenada	MOA
Elabanjo	Owolabi	Antigua and Barbuda	Agricultural Extension
Etienne-Leblanc	Sheryl	St. Maarten	Met Office
Fletcher-Paul	Lystra	Barbados	FAO
Gawthrop	Elisabeth	USA	Columbia University
George	Quincy	Antigua and Barbuda	
Gerrald	Gerren	Montserrat	Meteorological Office
Gibier	Florian	Martinique	Met Office
Gordon	Ivy	Jamaica	Jeffrey Town Farmers
Greenaway	Shawn	St. Kitts	SKI Water
Greene	Christina	USA	Columbia University
Guido	Zack	USA	Columbia University
Hernandez	Marieta	Cuba	Met Office
Isaac	Valerie	Barbados	CDB
Johnson	Elizabeth	Jamaica	IICA
Joslyn	Ottis	Belize	CCCCC
Joyeux	Andre	Saint Lucia	Met Office
Kentish	Anika	Antigua and Barbuda	CMC
King	Arnold	Bahamas	Met Office
Kirton-Reed	Lisa	Barbados	CIMH
Lumsden	Theron	Barbados	INTERN
Marcelin	Esterlin	Haiti	Met Office
Marcellin-Honore	Vernie	Dominica	Met Office
Marshall	Geoffrey	Jamaica	WRA Jamaica
Mason	Simon	USA	Columbia University
Mathurin	Junior	Saint Lucia	WRMA
McCook	Gusland	Jamaica	Coffee Industry Board
McShine	Nkese	Barbados	INTERN
Meade	Keithley	Antigua and Barbuda	Meteorological Office

Last Name	First Name	Country	Organisation
Miller	Trisha	Barbados	CIMH
Mitro	Sukarni	Suriname	Met Office
Munoz	Angel	Trainer	Columbia University
Neverson	Desiree	St. Vincent	Met Office
Oduber	Marck	Aruba	Met Office
Oonariya	Chalump		NOAA
Paige	Orvin	Antigua and Barbuda	Met Office
Pardo	Rikardia	TCI	Meteorological Office
Paul	Jaime	Barbados	BWA
Persad	Geeta	Trinidad	Met Office
Porter	Avalon	Cayman	Met Office
Roberts	Dennis	Antigua and Barbuda	Ministry of Agriculture
Rodriguez	Mario	Guatemala	USGS - FEWS NET
Roundtree	Valerie	USA	Columbia University
Simmons	Denise	Guyana	University of Guyana
Simon	Delano	Antigua and Barbuda	Meteorological Office
Simpson	Leslie	Jamaica	CARDI
St. Ville	Sylvester	Dominica	MOH Dominica
Stephenson	Tannecia	Jamaica	UWI Mona
Stoute	Shontelle	Barbados	CIMH
Sutherland	Tyrone	Trinidad	CMO
Tamar	Gerard	Grenada	Met Office
Thomas	Pamella	Antigua and Barbuda	CaFaN
Trotman	Adrian	Barbados	CIMH
Trotter	Adisa	Dominica	MOA
VanMeerbeek	Cedric	Barbados	CIMH
Williams	Magnus	Dominica	DOWASCO
Yearwood	Veronica	Antigua and Barbuda	APUA

Appendix B – Outlooks

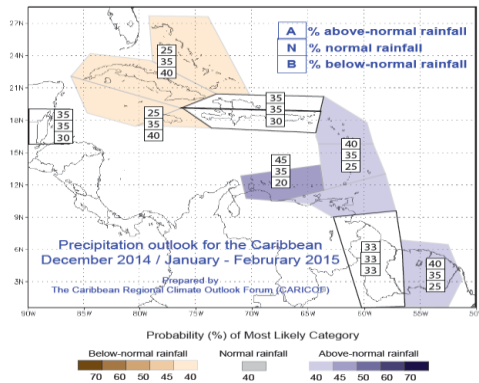


Figure 2: December 2014 - January - February 2015
Precipitation Outlook

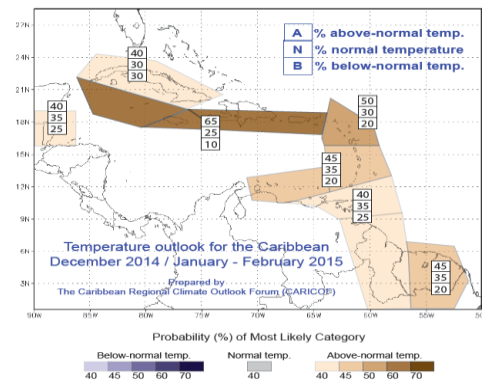


Figure 4: December 2014 - January - February 2015
Temperature Outlook

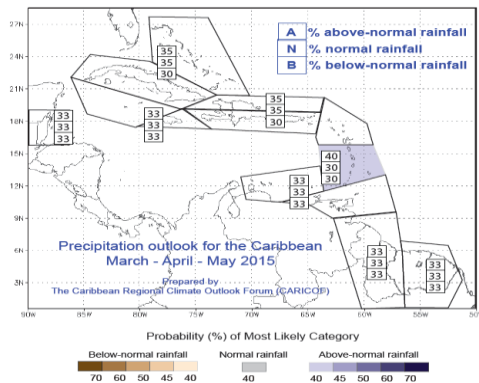


Figure 3: March - April - May 2015 Precipitation Outlook

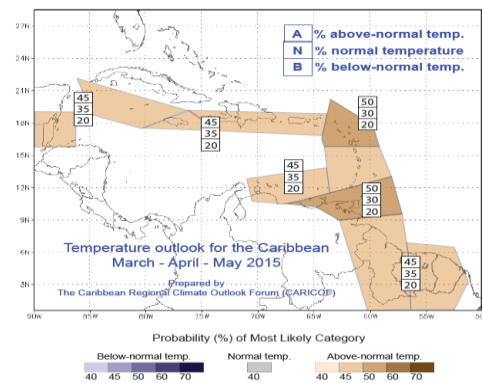


Figure 5: March - April - May 2015 Temperature Outlook

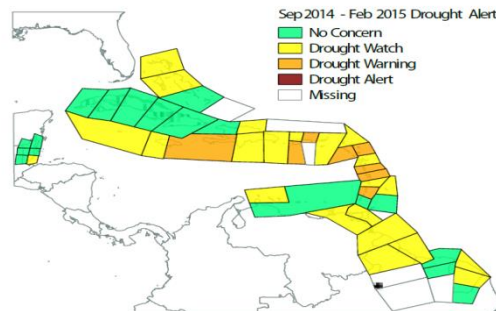


Figure 6: September 2014 to February 2015 Drought Alert Map

Appendix C: Responses from Break-out Groups

Agriculture:

Climate information available:

- Data from meteorological offices
 - o Automatic weather station data available from across the country
- Data for any country available from the Caribbean Community Climate Change Centre (CCCCC)
 - o Historical data as well as future projections of weather parameters
 - o Downscaling available upon request
- Products produced by CariCOF (rainfall, temperature and drought alert maps)
 - o Best practices: Jamaica Meteorological Service tailors information from the seasonal drought outlook to its farmers. This information is downscaled to the community and farmers have their own school where there are educated as to how to use the information (products).

Climate Information Needed:

- Evapo-transpiration data
- Better spread of weather stations
- Credibility (need to be able to trust outputs from forecasts)
- A model similar to Jamaica for tailoring seasonal products to other countries

Other Needs:

- Government needs to be involved at national level when alerts are issued (e.g. Jamaica has drought incorporated in their national disaster plan)

This group suggested that the drought alert categories would be best as: No concern → Drought Alert → Drought Watch → Drought Warning. The specific actions to be taken under these categories are as follows:

No Concern:

- Public Awareness
 - o Key task. Farmers need to prepare for what may or may not happen.
- Planning
 - o Continue to put measures in place in the event of drought (i.e. water containers, water harvesting, education and awareness, plans/policies, make sure farmers have all they need, identify drought resistant species/varieties)

These roles would be taken up by stakeholders.

Drought Alert:

- Implement planning actions
 - o As well as make sure you have access to drought resistant species/varieties

- Evaluate the development of pests/diseases
- Observe best practices
- Food storage for at least 3 to 6 months

Drought Watch:

- Intensify all Alert implementation measures

Drought Warning:

- NO fires to be set
- Implement alternative measures
 - o Prune fruit trees
 - o Culling livestock
 - o Cut and carry
 - o Food storage

Questions/Comments:

- For the watch and warning categories more specific action needs to be highlighted. For example, specific quantities for storage etc.

Water:

Climate Information needed by water managers:

- Present information in a simpler method
- Be more specific with country predictions i.e. provide list of countries in different alert levels
- Use more simplified language (allows easier dissemination of bulletin)
- Facebook group for Water managers and Meteorologists

It was suggested by this group for stakeholder training in order to better understand the bulletins produced.

This group also suggested categories to be No Concern → Drought Alert → Drought Watch → Drought Warning.

The specific actions to be taken for each category are as follows:

No Concern:

- Have your plans all laid out with respect to what you will do. Water managers are always planning and if you do not have a disaster management plan in place it is necessary to obtain one.
 - o It was suggested to CariCOF to have a list of the countries under drought categories as the map can be at times difficult to interpret.
- Continue monitoring water levels
- Continue public education and communication

- On-going conservation methods
- Practice water efficiency
- Review and update drought management plan { create one if needed}
- Investigate waste water reuse
- Encourage building rainwater harvesting systems (homes)
- Continue leak detection in water distribution network
- Make any infrastructure upgrades

Drought alert:

- Continue protection
- Increase monitoring of reservoirs and/or groundwater levels
- Increase leak detection and repairs to distribution system
- Begin weather bulletins and public education on past effects of drought on country
- Refresh drought management training for agencies (fire service etc)
- Disaster Officials meet to evaluate country's needs and investigate bulk water purchase options
- Contact neighbouring islands on drought preparedness and management

Drought Watch:

- Increase bulletins and public announcements
- Country's water agency to address public
- Sensitise public on water levels and current state of drought
- Sensitise public of country's laws against water wastage and associated penalties
- Begin to implement drought management plan
- Continue increased monitoring of reservoirs and/or groundwater levels

Drought Warning:

- Continue to implement drought management plan
- Government official to address public on current drought and actions being taken to supply public
- Water rationing as required
- Intense water conservation
- Continue increased monitoring of reservoirs and/or groundwater levels

Questions/Comments:

- Mr. Ottis Jocelyn (CCCCC) stated that other institutions should be made to implement water harvesting, not just homes as they are major users of water.
- Sheryl Etienne-Leblanc (St. Maarten Meteorological Service) stated that there were no actions outlined for the communities in the presentation. The only actions outlines were for the managers.
 - o Ms. Paul stated that the users can use information from the water management plans of the country.

- Angel Muñoz (IRI) asked what are the expectations for a more simplified language with respect to the maps?
 - o Less jargon
 - Dr. Meerbeeck emphasized that we cannot eliminate all jargon as doing so could give rise to incorrect interpretation. He noted however, that what was needed was some common ground between forecasters and users.
 - Jenni Campbell (Jamaica, Gleaner) stated that part of the plan should be to create a list of frequently asked terms and what to do in such an event
 - Mr. Trotman: When regional information is being put forth it is to serve the National Hydrological and Meteorological Services (NHMs) and at the same time get the information to the general public if they need it. The ideal scenario should be the NHMs receiving information from CIMH and translate to those concerned. In agriculture for example, there should be trained extension personnel in the country to relate the information to the person on the ground. However, in the Caribbean such is not the case (except for a few), as the extension services do not have the capacity to translate the necessary information. This has given rise to a lot of pseudo activity, which should not be.
 - Health personnel, Saint Lucia suggested that there should be a course in meteorology/climatology that would assist the sectoral workers.
 - Mr. Trotman responded that this has already begun as there has been training for agricultural extension officers.

Mixed Group:

This group comprised of personnel from Water, Agriculture, Health, Disaster Management and Media.

Available information:

- Drought outlooks

Information Needed:

- Climatic information needs to be tailored to the sector.
 - o Agricultural personnel would like to see more location-specific information.
 - o Media personnel stated that it needed information for users and what actions to take
 - o Water sector is requesting more lead-time information. a 3-month outlook would be useful.

It is recommended that there be vulnerability mapping, thus highlighting areas within the country which may need to be on a higher alert.

This group suggested that there be three alert levels rather than four, No Concern → Drought Watch → Drought Warning.

No concern:

- Monitoring, continuous planning (if you have a contingency plan you can test and/or update it)

Drought Watch:

- Conserve water, check infrastructure (water tanks etc.), collect and store water

Drought warning:

- Ration and conserve water

Questions/ Comments:

- Mr. Trotman: What do you think of moving from four to three levels of alert?
 - o Dr. Meerbeeck: It is not easy to determine the boundaries between

Appendix D: Responses to Simulation Exercise

Group 1

Observations on the island:

- Small island surrounded by water
- Volcano present
- At risk for storm surges

Development plan:

- Power plant, wind turbines and ocean technology, automatic weather stations, sensors, sea level monitors
- Climate and energy research centre to be constructed near the forest area which has to be functioning in the most dire disaster experience. Not close to the volcano or sea, at a suitable elevation to eliminate flooding. Observe that the island is at risk of being affected by storm surge, farming community close to the sea.
 - o Climate information, monitoring and evaluation
 - o Staff: agro-meteorologists, hydrologists, climatologist, communication specialists, researchers, legal officer, technicians
- Products: bulletins, advisory services, flood maps, hazard and vulnerability maps

Staffing:

With a focus on monitoring and evaluating climate and weather, this will include the following:

- Climatologists
- Agro-meteorologists
- Hydrologists
- Meteorologists
- Volcanologists
- Communication Specialists
- Researchers, lecturers, legal officers
- Technicians, IT specialists, Agriculturalists

Equipments and Resources:

- All equipment needed for the staff
- AWS, sea level monitoring; flow meters
- Seismic monitoring equipment
- Weather and Climate information; Bulletins involving all that have been monitored...
- Mapping: hazards, vulnerability, food, drought, fire

Recommended:

- Waste water management
- Proper road network to get people away from the volcanic area
- Effective communication strategy needed
- Disaster risk management plan and rapid response unit
- Training of Agriculturalists and Extension staff to be able to talk climate and weather, interpret data for dissemination to key stakeholders, especially the farmers and ordinary people on the ground.

Group 2:

- Develop national disaster plan and map out area for degree of risks
- Develop climate and seismic monitory centre (clear forest area near airport for centre)
- Create access roads from fishing village and other remote areas for better transport and evacuation.
- Install PV (photovoltaic) at hospitals and farms (homes if possible) to reduce dependency on power plant in likely event of destruction by volcano.
- Create sea water breaks to protect fishing village
- Install weather monitor stations across island
- Remove farming from volcano to resort
- Build sewage treatment plants
- Develop groundwater resources
- Investigate small mobile diesel plant
- Create legislation for environmental protection
- Feasibility study into geothermal energy
- Update building codes for climate and seismic
- Restaurants, homes

Group 3:

Stakeholders:

- Farmers, fishermen, land developers, hotel owners, transit authority, land-use planners, ministry of Finance, Ministry of Tourism, Ministry of the Environment, Ministry of Agriculture, Fisheries, Forestry, Ministry of Social Development, Health and Welfare, environmental non-governmental organizations, Emergency services managers, disaster management agency, media

Vulnerability Assessment:

- Environmental analysis to examine and scope the potential impacts in defined geographical area (with maps)
- Stakeholder analysis and review risks to communities
- Stakeholder consultation to listen and radiate plans based on current activities

- Evaluate level of climate risk to each stakeholder group
- Identify assets, resources and capacities to cope and what is needed
- Communicate plans to stakeholders
- Develop adaptation plans to build resilience in ministries
- Bring together ministries to discuss roles and plans