

## **Caribbean Climate Outlook Forum (CariCOF)**

May 27<sup>th</sup> to 28<sup>th</sup> 2013

### **REGIONAL CLIMATE OUTLOOK FORUMS – THE CONCEPT (World meteorological Organization, WMO)**

These forums bring together national, regional and international climate experts, on an operational basis, to produce regional climate outlooks (or forecasts) based on input from National Meteorological and Hydrological Services (NMHSs), regional institutions, Regional Climate Centres (RCC) and global producers of climate predictions. By bringing together countries having common climatological characteristics, the forums ensure consistency in the access to and interpretation of climate information. Through interaction with sectoral users, extension agencies and policymakers, Regional Climate Outlook Forums (RCOF), assess the likely implications of the outlooks on the most pertinent socio-economic sectors in a given region and explore the ways in which use could be made of these outlooks. The core concept of all RCOFs remains the same: delivering consensus-based, user-relevant climate outlook products in real time through regional cooperation and partnership. However, since national and regional capacities are varied and, in some cases, are inadequate to face the task individually, the implementation mechanisms of RCOFs in different regions have been tailored to meet the local conditions.

The RCOF process typically includes the following components:

- Meetings of regional and international climate experts to develop a consensus for the regional climate outlook, typically in a probabilistic form;
- The forum proper, which involves both climate scientists and representatives from the user sectors, for identification of impacts and implications, and the formulation of response strategies;
- A training workshop on seasonal climate prediction to strengthen the capacity of national and regional climate scientists;
- Special outreach sessions involving media experts to develop effective communication strategies.

RCOFs also review impediments to the use of climate information, experiences and successful lessons regarding applications of previous RCOF products, and enhance sector-specific applications. These RCOFs then lead to national forums to develop detailed national-scale climate outlooks and risk information, including warnings for communication to decision-makers and the public.

The 2013 CariCOF adhered to the recommended components, except for yet engaging the media, but has prepared for this component by placing some focus on effective dissemination and communication during a pre-COF training session for meteorologists and climatologists.

### **OPENING CEREMONY OF THE GENERAL ASSEMBLY**

The two-day meeting of the Caribbean Regional Climate Outlook Forum took place on May 27 – 28, 2013 at Capital Plaza Hotel, Port of Spain, Trinidad and Tobago. The meeting was attended by staff of National Meteorological and Hydrological Services (NMHSs) from across the region as well as representatives from regional and international organizations such as the Caribbean Institute for Meteorology and Hydrology (CIMH), Caribbean Meteorological Organisation (CMO), Caribbean Community Climate Change Centre (CCCCC), Caribbean Disaster Emergency Management Agency (CDEMA), Caribbean Natural Resources Institute (CANARI), World Meteorological Organisation (WMO), the U.S. National Oceanic and Atmospheric Administration (NOAA) and the International Research Institute for Climate and Society (IRI).

The meeting commenced with a brief introduction on behalf of the Principal of the Caribbean Institute for Meteorology and Hydrology, by the Chief of Applied Meteorology and Climatology, Mr. Adrian Trotman. Mr. Trotman acknowledged the participants representing the various sectors, such as the Ministries and other national organisations responsible for Agriculture, Health, Water, Disaster Management and Tourism, as well as participants from CIMH, CMO and WMO.

This was followed by a sequence of brief words of welcome from representatives of some of these organizations. Mr. Kenneth Kerr, representing the Acting Director of the Trinidad and Tobago Meteorological Services, officially welcomed all participants to Trinidad and Tobago. Mr. Tyrone Sutherland spoke on behalf of the CMO and Dr. Rupa Kumar Koli (WMO) pointed out that the main objectives of the meeting was to discuss the issues that link climate information, particularly seasonal forecasts to sectoral decision making and planning.

Another welcome was extended by Dr. Roger Pulwarty (NOAA); he spoke briefly about the role of seasonal forecasts, climate variability and climate change as well as the purpose of the RCOF.

## **PRESENTATIONS**

### ***Regional Hazards - Lyndon Robertson, CDEMA***

Mr. Robertson spoke about regional natural hazards such as hurricanes and windstorms and the impacts these natural disasters have on the region. He went on to display a number of slides depicting erosive conditions throughout the Caribbean, which came about as a result of storm surge, floods and hurricanes. In particular he drew attention to the flood event in Trinidad in the year 2008.

A table of impacts from different events in various countries across the Caribbean was then illustrated. The table also included financial losses due to these hazards. Mr. Robertson also spoke about the likelihood of fewer but more intense tropical storms in the future due to Climate Change. He then informed that the analyses of model outputs such as precipitation, are available to aid in scenario planning and decision making. He also mentioned that the persons at the national and regional level are also equipped with GIS skills that would be an asset for analyses. Mr. Robertson concluded that CariCOF provides users with seasonal forecasts that greatly aid in decision making and resource allocation. In his closing statement with respect to key issues and opportunities, he emphasised the need to “Fulfil End-User Needs”.

### ***Climate Early Warning - A means for Adapting to Climate Change? - Dr. Ulric Trotz, CCCCC***

Dr. Trotz started off answering the title question by directly saying ‘yes’ that Climate Early Warning is a means for adapting to climate change. He then indicated that adaptations to climate change are adjustments made to reduce vulnerabilities.

For adaptation measures to be determined there would be a need for processes such as the downscaling of global climate models, and regional climate change scenarios and projections. Dr. Trotz also mentioned some initiatives already in progress, such as those that identify the extent of risk; as he noted that the Caribbean is already vulnerable to risks arising from present day climate variability. He also mentioned that Early Warning Systems were important for the provision of timely and effective information to help reduce impacts, by allowing for preparation time, as we find ourselves responding to changes in global drivers like ENSO. He also mentioned the importance of knowledge of risks from hazards such as hurricanes, when it comes to monitoring and warning services.

Dr. Trotz then turned attention to the water sector and how it is affected by climate change. He pointed out the increasing variability in the hydrological cycle which has been evident over the past two years. In terms of adaptation measures, he advised participants about the importance of increased storage, in terms of the design and capacity of reservoirs, and the need to cope with excessive rainfall amounts and resulting runoff.

The importance of restoration and extension of the hydrological data base was also raised, which sparked some discussion over the potential challenges of available water throughout the Caribbean, due to projected reduction in rainfall and its availability in years to come.

Among the issues currently being looked into were the problems encountered with water catchment, and water loss due to runoff and a problem with aquifers not being recharged.

### ***Global Framework for Climate Services - Dr. Rupa Kumar Kolli, WMO***

Dr. Kolli highlighted the various the users of climate services; for example, government, the private sector, research, agriculture and transport, noting that the concept of Regional Climate Outlook Forums (RCOFs) provide platforms for climate experts and climate information users to discuss current climate status and to exchange views on climate developments. The RCOF process, comprises of large scale prediction by national climate experts providing perspectives in their respective countries. The process of inputs was also mentioned, noting that statistical forecasts, usually driven by Sea Surface Temperatures (SST) are utilized. This also includes probabilistic forecasts and conditional Climatology, which follows the state of ENSO, and its relation to the various impacts. He also reported that to do such, capacity building is necessary at the national level.

Dr. Kolli then directed attention to food security outlooks and how they relate to RCOFS. He afterwards focussed on public health and the many diseases that are indirectly or directly associated with climate. He spoke about the challenges involved with the use of climate products by end users, noting that in some cases they might be quite understandable to some, but require much more explanation to others. Dr. Kolli also highlighted problems with respect to gaps in observation data as a major issue, which needs to be addressed.

Dr Kolli ended with a discussion about the concerns of funding in terms of sustainability of the RCOF activities.

### ***RCOFs and RCCs - The Caribbean Context - by Adrian Trotman, CIMH***

Mr. Trotman commenced by briefly informing of the Seasonal Forecasting and Verification training workshop for meteorologists and climatologists, which directly preceded the CariCOF (the Caribbean version of RCOF) meeting, He presented the previous forecast that was prepared for May to July 2013, giving explanations as to the interpretation of the information. He went on to mention the various potential users of these services, many already around the table, hence showing the usefulness of the product. Mr. Trotman also indicated that participants would later get to see the most recent forecast as prepared during the Training Workshop, for the period June to August and September to November.

The functions of WMO designated Regional Climate Centres (RCCs) were presented, with reference to operational activities and product and tools for use by multiple sectors. Providing seasonal forecasts that are subsequently verified, along with observed and historical climate information are important tasks of an RCC. The outlooks from CariCOF are important to the RCC One of the tools mentioned for rainfall monitoring was the Caribbean Rainfall Impacts Reporter, which allows users to indicate impacts from drought/dry spells and excessive rainfall in different parishes/provinces/regions that would allow better assessment of drought, in particular, and a database of impacts of both extremes. He also introduced the Caribbean Water Monitor that allows for national monitoring of rainfall that would help to determine drought severity. Mr. Trotman highlighted that drought monitoring and forecasting was very important to sectors such as agriculture and water resources.

Mr. Trotman also mentioned that CIMH, through funding from the Caribbean Development Bank, developed a regional climate database, including a web portal for users to access the database. This tool would be accessible, once completed. Data provision was an important role of a RCC.

## ***Panel Discussion - Regional Perspectives on Climate Impacts, Water, Agriculture and Food -***

### ***Dr. Arlene Laing, UCAR/ COMET - Moderator***

In leading into the main panel discussion, Dr. Laing's focus was on Climatologists, and the services they provide. She noted that these persons specialise in monitoring and analysing climate.

She then spoke of regional monitoring, where she made mention of the Caribbean Water Initiative (CARIWIN) project, and briefly explained it, along with the Caribbean Drought and Precipitation Monitoring Network (CDPMN) with particular focus on the Standard Precipitation Index (SPI), which is used to make estimates of wet and dry conditions calculated for different time scales, short term or long term, based on precipitation only.

Dr. Laing also spoke about climate impacts and decisions, highlighting that they differ across and within sectors and urged participants requiring these services to help climatologists to understand their decision making timeline. Also discussed was the most suitable ways by which this information may be communicated, and it was suggested that radio and face to face are just some of the ways that this may be done.

This led into a panel discussion, with representatives from the agriculture and water sectors providing their views on the benefits, gaps and opportunities of climate information. A summary of their main points now follow.

### ***Dr Leslie Simpson (CARDI) - Panelist***

One of the major problems identified by Dr. Simpson in the Caribbean agricultural sector was that agriculture in the region is mostly rainfed, and rainfall is quite variable. In the extreme cases, drought results in great loss of crop yields and in the case of floods, in addition, great damage is done to the infrastructure of the soil.

Another point mentioned was problems encountered with respect to data collection, particularly its paucity, acknowledging the importance of rainfall data, in particular to the agricultural sector.

Dr. Simpson recommended that climate information provided for farmers must be relayed in a language that they can understand, and through an accessible medium. He further suggested that the information can be quite easily relayed via text messaging and leaflets.

The last point Dr. Simpson mentioned was with regards to the importance of the formation and maintenance of National Tri-Partite committees formed through the CAMI project, recommended to comprise of members of the agricultural sector, farmers and Meteorological staff, as this is one of the main ways of bridging the communication gap between these groups.

### ***Ipha Miguel (Farmer/Caribbean Farmers Network, CaFaN) - Panelist***

Ms. Miguel spoke mainly about production planning and the importance of choosing the appropriate crops based on the climate conditions. As the climate of a particular region changes, it is important for farmers to choose suitable varieties of crops which can adapt to these changes, or in some cases, it may require the planting of an entirely different crop altogether.

### ***Danroy Ballantyne, Central Water and Sewerage Authority, St. Vincent and the Grenadines - Panelist***

Mr. Ballantyne focused on the importance of water. He noted that the Caribbean is dealing with shifts in the rainfall pattern, and how this can greatly affect the agricultural industry. He also mentioned the negative impacts due to flooding and hurricanes, mentioning the effects of the impact inflicted on the region after the passage of Hurricane Tomas.

Mention was made also of the recent 2009-2010 drought that impacted the Caribbean. He particularly reported on the contamination of water caused by over pumping, noting that St. Vincent and the Grenadines is not normally a water scarce island.

### **Ricardo Ramdin, Water Resource Agency, Trinidad and Tobago - Panelist**

Mr. Ramdin spoke about the different forms from which potable water is available - desalination water, ground water and surface water. He reported that the main source of water in Trinidad and Tobago is surface water and that the dry season in Trinidad and Tobago is from January to May. He also noted that the rainfall outlook is currently being used, but mentioned that a request has been made for a precipitation forecast to be provided specifically for them, especially for the dry period.

Another request made was for the provision of the amount of rainfall required to fill the reservoirs they presently have.

A concern mentioned by Mr. Ramdin was with respect to the timely provision of information.

### **Afternoon Session**

This session was geared towards determining the questions that we need to ask ourselves, so that we are more aware of what is needed for better communication and understanding of climate information.

### ***Regional Perspectives on Climate Impacts – Ecosystems, Health, Tourism***

Moderator – Glenn DeSouza (CMO)

Panelists: Cropper Foundation; CANARI; Ministry of Health, Dominica; Turks & Caicos Tourism; Ministry of Health, Barbados

The moderator began the session by throwing out a question on what is the most lucrative sector in many Caribbean countries - all our countries have a tourism industry, and with climate change, we all wonder what will happen - will it exist the way it is now?

#### ***1. Alexander Girvan, Cropper Foundation:***

- The Cropper Foundation is a Local NGO, working with international and local agencies on ecosystems research and communities. A presentation was made on Ecosystems services and climate change.
  - o Ecosystems services were well defined through the Millennium Ecosystem Assessment (MA), indicating how ecosystems enhance human well-being.
  - o As an Environmental economist, the thought of dollars made and dollars saved makes sense. This is important for understanding this topic.
  - o Ecosystem Services of Importance to the Caribbean include - fisheries, tourism, agriculture but also pollination services (importance for crops); hunting for subsistence; food and beverage (utilises 60% use of water in Trinidad and Tobago, 40-60% from Northern Range (one well know ecosystem) of Trinidad).
  - o Ecosystem services help prevent money being taken out of our pocket. For example, a functioning ecosystem can safeguard from top-soil erosion and the need to replace it due to flooding; another example is that coral reef degradation and coastal erosion are reduced, which are vital for tourism and coastal infrastructure.
  - o Why is climate data important to us?
    - Modelling of ecosystem service delivery. Similar to how hydrologists model water.
    - Precipitation
      - Soil erosion and flood prevention (e.g. how northern range regulate erosion and flooding)
        - o Water delivery and purification (think of Trinidad & Tobago, how industry relies on water)

- Habitat dynamics
- Temperature
  - Coral bleaching – tourism and subsistence income. In bad events, people go back to environmental degradation
  - Habitat dynamics – tourism, agriculture, subsistence
- Big picture – hopeful direction
  - Downscaled information and climate data is necessary for island specifics. These scenarios can then be presented to politicians. Economics is necessary for communicating this impact of climate change (CC), which can then influence how CC is mainstreamed.

## **2. Austin Greaves, Ministry of Health, Barbados:**

- A Climate change project is being executed in Barbados funded by the Global Environmental Facility (GEF) in 7 pilot countries throughout the world, with Barbados being the only country in the Western hemisphere involved, mainly due to the water deficient nature of the country. Barbados falls below a UN threshold for available water – 1,000 m<sup>3</sup> per person. Barbados has about 350, about (1/3 of this threshold) and the question was raised as to how the country survives with this.
- The aim of the project is to increase adaptive capacity of the health sector – the project is managed in Barbados by the Ministry of Health.
  - Early warning systems, one of main objectives mentioned of the COF, can be of assistance in:-
    - Tackling dengue - An effective Early Warning System (EWS) in Barbados is important - Barbados is the dengue capital of Caribbean –
    - Water scarcity – with sea level rise leading to saline intrusion in underground aquifers, the latter forming our largest drink water reservoirs.
    - While we are speaking about CC and vulnerability, health is the most significant thing we all have. Even if we lose money, as long as we maintain our health, we will prevail.
    - When an outbreak occurs, a large pool of resources is needed for recuperation. So as a consequence of CC, health will suffer, affecting all sectors including tourism (tourist and worker).
    - CC will also affect water-borne diseases that cause diarrhoea, particularly in children. If adequate amounts of water are unavailable, this is exacerbated, since 60% of infectious diseases result due to bad hand washing practices.
    - Besides dengue, the Project further has a component of gastroenteritis. Achieving the goals of the Project will rely on early-warning systems being developed, with National Meteorological Services embedding climate information within that system run by the Ministry of Health.
    - The Coastal Zone Management Unit of Barbados collaborates with CIMH so that the Environmental Health Department can have data and information for planning. An EWS needs to be in place to predict likelihood of outbreak months ahead so that surveillance teams can be placed on the ground to mitigate risks.

## **3. Brian Been, Turks & Caicos Tourist Board:**

- An economic study done on environmental impacts shows reefs contribute US\$47million to the economy, so this is important to consider.
- CC is not a debate anymore in Turks and Caicos Islands (TCI).
  - Tourism is the world's largest industry. Provides foreign exchange, alleviates poverty, attracts investment and incentives, and accounts for 59% of GDP in TCI.
  - The Climate Change Risk Atlas shows that tourism is vulnerable to CC as much as fishing.
  - Destinations are now promoting food and culinary, health, and wellness, but are still dependent on the environment, so there is little to promote if the environment is not taken care of.
  - Majority of Tourism is in coastal zones, since everyone wants to be on sea front, which could be under threat from CC – sea level rise (SLR), storm surge etc. More dialogue needs to be stimulated since there is lack of risk mitigation. One positive is the Caribbean Catastrophe Risk Insurance Facility (CCRIF) – TCI was one of first countries to benefit after Hurricane Ike.

- Natural sand dunes are being lost to development, making the country/tourism facilities more susceptible to SLR and storm surge
  - 0.5 m of SLR is estimated to result in the loss of 53% of beach in Grand Turk, West Shore, and 65% in historic Cockburn town; while 1m of SLR can result in 61% loss of the beach at Grand Turk Cruise Centre of TCI.
- Coral reefs are now more vulnerable since they are already impacted by sedimentation and overfishing.
- There is a green paper (Department of Environment and Maritime Affairs) that provides a platform for facilitating ongoing consultations and applies a holistic approach - finding a way forward on viable CC strategy for TCI.
- Other Environmental impacts from CC include:
  - Rising sea surface temperatures (SSTs) that can result in more frequent coral bleaching events
  - Rising air temperatures can result in loss of vegetated areas and species
  - Loss of beaches and damage to reefs due to storms – Ike caused US\$2m in damages
- Some socio economic impacts
  - Impact on tourism product, resulting in a less marketable travel destination, with reduction in visitor arrivals and loss of foreign exchange
  - Loss of tourism livelihoods, direct and indirect

#### **4. Celeste Chariandy - Caribbean Natural Resources Institute (CANARI)**

- Lessons learnt from Civil Society interaction in CC awareness building and adaptation planning exercises – regional perspectives on climate impacts:
  - Before: the focus was on climate modelling, impact of CC on terrestrial and marine and coastal biodiversity but
  - Now: because CANARI works with people and communities, there is a greater focus on communicating with end users. There is also the need to bring how they are directly impacted to the fore.
  - Some aspects of the of CC and DRR programme of CANARI – research, public awareness and community adaptation
    - There was a participatory 3D modelling exercise in Tobago, Oct 2012 that promoted ICT for adding to traditional knowledge for climate change adaptation, advocacy and policy processes in the Caribbean. Information was gathered that showed what locals thought was required for action on food security, tourism (dive tourism), infrastructure, water and other resources.
    - There exists a Civil society agenda on CC in Tobago.
    - There was a pilot on community resilience building in Caura, Trinidad, where residents rely only on truck-borne water for treated source. Residents did their own vulnerability assessment and what action to take. There was also training in wastewater harvesting.
    - Training and development video of Caribbean fisher-folk, Nov 2012
    - There is on-going Research on national adaptation readiness, vulnerability assessments, and coordinating mechanisms in St. Lucia and Trinidad & Tobago
  - Training in ecosystem approach to fisheries management and CC for fisher-folk
    - 18 fisher-folk from 14 countries shared and gathered knowledge of what they thought were impacts and responses– e.g. go out further, stay longer.
    - Civil Society wants to have a seat at the table as well. There is a need for capacity building to help them in terms of where they could contribute and relay back to key stakeholders-
  - The following was clear from the community engagement:
    - Must simplify communication on key environmental issues such as CC to promote action
    - People’s understanding of issues can provide new ways of communicating (maybe this is a missing link), experiences must be in their language.
    - Need to capture and document new knowledge.
    - Better and greater engagements needed, giving people new tools for action

Dr. Mason indicated that climatologists can give some general idea of what the conditions will be like, but we cannot be very definite when making climate forecasts. He indicated some important things to consider, particularly when comparing forecasting the weather (shorter term) compared with climate (longer term):

- What makes a good forecast?
  - If we are forecasting far into the future, it's not about saying what we think, but how confident we are about that prediction.
    - Essentially, forecasts given probabilities relative to normal (for example, above or below) are (i) Difficult to make, based on information, (ii) Difficult to use.
    - So training is important for (i) improving quality of information, including the skill of predictions (for example using ROC diagrams, but can be at times confusing, and (ii) assessing what technical information is helpful, and how they can be used to improve the product.
  - Dr. Mason also highlighted the importance of having climate tools, as they address difficulties in producing seasonal climate information. These tools help to:
    - Improve skill, providing access to state of the art procedures to help ensure the production of high quality information.
    - Improve slow production time as most NMHSs are under-staffed and some tools reduce the workload.
    - Provide access to other types of climate information quickly.
    - Improve communication, and help to address the specific needs of different user groups.-

Dr. Mason went further to say that the CariCOF forum is really to gain knowledge on how to produce what users need to know in the way they can use it. Probabilistic forecasts are inherently difficult to use – but not because they are probabilistic. Everyone uses probabilities in some form and we are therefore always aware of inherent uncertainty. He however stressed that the impacts from weather and climate phenomena are more important, and where we should be asking the right questions. But we are not right now in a position to answer these questions, but are along the lines of whether this forum can initiate these ideas.

Dr. Mason added that there is a need to think about decision-making across timescales, which also influences the kinds of decisions people make in terms of planning. Users also need to know the kinds of decisions that can realistically be made at the different timescales. Is there some useful information that can be provided to help make these decisions? Can we really say three months ahead of time that there will be flooding?

The lead time ahead of a particular period necessitates different actions from putting things in place based on forecasts and preparing to act with greater imminence. Training is important to ensure that bad answers are not given to interesting questions. But it does not guarantee against us giving good answers to boring questions. Access to technology and partnerships are also important in order to make sure that useful answers are provided to important questions.

A discussion followed that focussed on interpretation of the information provided in outlook/forecasts. How does one distinguish between a good forecast and a correct forecast? For example, it was stated that what happens might not match up quite well to what you thought would happen because of the forecast, as since probabilistic, the improbable can happen! So it is also important to be able to explain yourself when you are wrong. It was suggested that there should be greater focus on providing information with a degree of uncertainty. There is a need to develop trust and understanding and go through a process of populating a table of tasks to be done, in a meaningful way. As trust is built, the society can start to identify what decisions to take economically and socially (if there are development or livelihood decisions), so there are a host of research options of how to translate this information into action.

The discussion also indicated that a forecast for the next few months does not indicate what will happen during the period itself. For example, if above normal is forecasted and a high risk of flooding, it cannot tell you when the floods would take place.

### ***Communicating Information on Climate: Stacy Swaby, PANOS-Caribbean (Jamaica)***

Ms. Swaby described PANOS as a regional Non-Governmental Organization (NGO) based in Haiti with offices in Jamaica and Washington, D.C. Panos works with the media to communicate Sustainable Development issues, health, gender, child rights, media and environment. It is also part of a regional committee working with the CCCCC.

Ms. Swaby first asked the participants to put on their layman's hats before responding to questions such as:

- "Is climate change a difficult issue to debate?"
- "Is there an issue with the technical jargon used?"
- "Is there still a debate about credibility?"

She noted that regardless of the hat worn, one is aware that there are climate impacts. Of importance is how the information is communicated to the less educated and not just bureaucrats, politicians and peers. The information should also be shared in a format that they can interpret and respond to.

Ms. Swaby went on to explain that the region was experiencing more extreme events and that PANOS was finding effective ways to communicate these issues to different audiences, noting that they are working with other partners to communicate these issues nationally and regionally. She went on to list a number of projects in which PANOS is involved, including:-

- Mocho Oral Testimony project on Climate Change (Jamaica) – using trained community leaders to capture information from farmers, everyday persons affected by landslides and droughts due to mining.
- Voices for Climate Change Education (Jamaica) – educate Jamaicans about CC and the impact it will have on their lives. Targets "grassroots" people and how information for various sectors can be best communicated to them, using popular performing artists to reach a large sector of society that would not otherwise be reached. Panos also (i) hosts workshops for the vulnerable sectors, (ii) organised 13 parish outreaches with about 1000 persons per parish and over 20 small community events reaching roughly 400 persons per outreach, (iii) staged mini concerts with 36 primary and high schools. Community persons and artistes are now empowered to share regionally and internationally.
- Canadian Caribbean Disaster Risk Management Fund project on developing a pilot Early Warning System for persons with disabilities (Jamaica). Many consider this aspect in terms of how people can hear a warning if they are deaf, or understand what is going on if they are blind.
- MacArthur project on Climate Change and biodiversity, policy and communities in post earthquake Haiti.
- Critical Ecosystem Profile Fund – boosting communication and networking among conservation groups and the media in 11 Caribbean islands
- FAP regional project (for protected areas) – strengthening community's preparedness and resilience.

Ms Swaby informed that the message is communicated in cultural art-forms, (drama, popular artistes and music); through the media (fellowships and training); and via meetings, training and workshops, publications and other media such as PSAs and use of social media.

In concluding, Ms Swaby offered some recommendations:

- Include the grassroots population in the communication package when writing the proposals, so that they can understand and relate.
- Avoid the over use of scientific terms. Regulate the level of usage based on target audience.
- Utilise audiovisual aids, with little or no text, for presenting CC and climate issues.
- Show linkages between the issue and concept being communicated and how they can be impacted to really send home the message.
- Use popular artiste. For example, the link was illustrated through a music video "Global Warming" by 24 artistes, which is the theme song for the Voices for CC Education (Jamaica) project.

PANOS was applauded for its work. The discussion that followed sought to determine how such approaches like this by PANOS can be incorporated into sharing the information and spreading the word on the approach of seasonal climate forecasting. One participant focussed on the importance of such work at the grass-roots level (for example by PANOS and CANARI) where communities are engaged and made aware of climate and climate change, and there is a healthy exchange of knowledge. The participant went on to suggest that the various stakeholders would need the information packaged in different ways.

***Seasonal Early Warning and Climate Risk Management – preparedness and adaptation:*** Roger Pulwarty NOAA

Dr. Pulwarty reported that every forecaster makes a judgement based on experience and does not solely depend on model output. He asserted that individuals must be allowed to question the capability of the modelling system. The aim was to create support in the information by creating a mental map of what people already know. One important thing he did mention was that climatologists need to ensure that the risk of being wrong is understood and acceptable.

Dr. Pulwarty also highlighted a number of important points, at times asking some probing questions:

- Communication is one thing but embedding into practice is another. There is a need to utilise what people understand and already know to help get across the message, but more effort must be placed on communicating the information; awareness is one thing, but getting action is another; communication is necessary but not sufficient, What we value is often more important than the information itself, so there is often deferred maintenance.
- How do we link the timescales? What matters? How do we embed long-term projections on CC into practice? We usually respond to events, acting through crisis and response, but not always to this information in and of itself. It needs to be made clear that change not only comes in changes in means but also in the extremes, and one extreme event can gravely set back Caribbean economies. Also, with other non-climate changes and pressures, such as population growth, small climate events are becoming more impacting.
- In the Caribbean, variability is initiated from a host of drivers (PDO, AMO, ENSO etc), so to improve the skill, we have to know how well we understand the seasonal influences, and understand the relations between the climate variability and other factors. For example, La Niña increases the likelihood of hurricanes, but how does this relate with other ongoing factors? How do we ensure that the risk of being wrong is acceptable?
- Coordinated process is necessary to reduce risk, and we must take advantage of opportunities to improve resilience of systems.
- There is some subjective component to the information, based on what is actually happening in practice. It is not just based on a model and also, should not only use one model, but several.
- Setting up a forum that people can question the information and nature of the information provided is important. The Global Framework for Climate Services (GFCS) is creating the support for such forums.
- How do we get to the point where we are not just monitoring, but we also get to surveillance? Onset of drought is not what matters, but it's the peak or impacts that are important.
- How would Early Warning Systems (EWS) have helped us in previous decisions? As we get more information, we need to go back to past events to think about whether it would have helped in predictions, in order to build trust etc.
- Need to be careful of overconfidence. We think we know this problem from before, but we have to be careful that many of the things we have come to learn might not apply completely, but partially. Learning how to map these entry points is important.
- It is not only about convincing people to use the information, but offering a space to question, that can attempt to build credibility. We need to understand what practices to keep and what to develop.

The discussion and questions that followed focussed on how forecasts and their interpretation can be improved. The forecast becomes very 'good' with well-known drivers like ENSO, but how can they be improved otherwise, and how can the probability numbers be interpreted. The use of analogs was suggested where the forecast was to be constructed based on a comparison of current climate conditions to similar situations in past years, where the forecast suggests a similar evolution of climate conditions as in those previous years. It was also suggested that documentation of analogs is rare in many parts of the world. However, it was further suggested that the use of analogs can provide indications of worst case scenarios. What is also needed is to know who and what are impacted.

## Day 2

### Presentations

#### **Review of the Rainfall (and Temperature) for the period February to April, 2013 - A. Trotman, CIMH**

The day's events started off with a review of rainfall and temperature by Mr. Adrian Trotman of the CIMH. He did this by reviewing SPI maps for the period February to April, which provides the actual rainfall severity situation, and then making comparisons with the rainfall forecast for the period. The same was done with temperature. Mr Trotman also went earlier into late 2012.

#### **Seasonal forecasting in the Caribbean - Cedric Van Meerbeeck, CIMH**

Dr. Van Meerbeeck began by looking at the June-July-August, 2013 climate outlook, provided as probabilities of normal, above and below normal rainfall.

Dr. Van Meerbeeck also reported on the training sessions which took place in Barbados in 2012, and the training that preceded this particular COF. He notified all about an active online (via email) discussion presently going on between the Meteorological/Climatological Services of 20 Caribbean territories, which results in the production of the 3month forecasts at zero (0)- and three (3)-month lead times.

He also pointed out some of CariCOF successes, which include progress in forecasting, noting that rainfall observation data is shared by 24 countries/territories, that there is improved familiarity of national met services with methodology and that there is a greater objective modelling component.

He also noted some social successes of CariCOF which include the activation, stimulation and sustenance of systematic collaboration between national weather services across the English, Spanish, Dutch and French speaking Caribbean territories; promotion of seasonal climate variability and related possible hazards to national and regional stakeholders; catalysation of collaborative work and generation of funds towards international collaboration on preparedness through technical training and general assembly; and through collaboration with Central American COF (COFCA), the identification of processes to initiate and sustain a workable method for climate impacts reporting.

Dr. Van Meerbeeck then spoke on temperature and rainfall variability and its predictability in the Caribbean in seasonal forecasts. He spoke on consensus outlooks and the use of precipitation outlook maps and the effective communication of this information, which was part of the focus of the training that preceded.

Finally, Dr. Van Meerbeeck addressed the question of what lies ahead for CariCOF. He advised that further training of forecasters is required for the CariCOF forecasting process to attain maturity and outlined the training available noting that training should be an iterative process. A tool once learned will only be used if there is frequent practice, and forecasting skills will only improve through regular communication on methods and updates. He ended his presentation by pointing out that this is what is currently offered, and asking participants to identify their needs.

#### **Hurricane season climate forecast - Glenroy Browne, Jamaica Meteorological Service**

The NMHS's were acknowledged for rainfall data delivery and their participation in modelling efforts. This presentation showed the CPT probabilistic June to August (JJA) rainfall forecast and described a number of experiments for September to November (SON) rainfall, noting that besides the major control of ENSO (here represented by Pacific tropical SST anomalies) on Caribbean rainfall variability, experiments take the Atlantic SST anomalies into account, as Atlantic SSTs are perhaps the second-most important driver of rainfall throughout the Caribbean.

JJA and SON rainfall outlooks were provided along with a hurricane outlook with landfall probabilities and expected conditions during the Atlantic 2013 hurricane season. The JJA forecast suggested above normal rainfall with high confidence, but normal conditions for SON rainfall with low confidence.

### **Break-out group: Health and Nutrition, Ecosystems, Tourism, DRR**

Feedback to JJA forecast and the outlook from sector representatives:

- Outlook should have guiding notes to explain what is seen on the map. (DRR) suggested improvement
- Gives guidance on programme for mosquito (Health) e.g. planning for fogging exercises.
- Has implications for finances (Health) as control programme is driven by overtime.
- Contamination of water sources (Health) leading to increased opportunities for gastroenteritis.
- Reference point is useful e.g. reference to conditions for the same period for the previous year (suggested improvement)
- Use of particular references in figures is important (Health) e.g. comparison to a mean value; this helps catch the attention of those in the health sector who work with formal figures.
- Met Office guided by certain protocols; "normal" is in reference to a 30-year average (climatological reference 1961-1990); some countries in the region may not have 30 years of records
- (Health) what can be expected in terms of millimetres of rainfall? This will help in understanding how much water is on the ground.
- Climate information produces an impact; the historical impacts need to be documented so that the potential impact can be prepared for when the climate outlook is provided. (suggested best practice for sectors).
- Health sector needs to say to Met Office what are the thresholds of interest.
- Shorter term forecasts may be of great value to particular sectors to take particular action.
- Need to have greater linkages in which information is shared so sector can make the best decision in a short period of time.
- Health wants information to be more robust to help in decision making. Lack of rainfall data means that gaps exist.
- Met Office can provide a lower limit and upper limit (e.g. mm of rainfall) and this may be more helpful.
- (DRR) At the 'ready' stage now; In Jamaica they have categorised communities in terms of level of vulnerability, so the outlook can help in identifying the type of action that can be undertaken in the different types of communities and when. (best practice?)
- Met Office and Health perhaps do not integrate sufficiently?
- Need for better co-ordination to document information within sectors and to share information on 'events' with the Met Office.
- Need to communicate in language that is understandable and also relevant to the country/region and planning of outdoor events for the seasons.
- Sustainable livelihoods impacted especially in Tourism sector; links between sectors is also important.
- Link historic impacts to climate information/records.
- When is the information needed and what information is needed by the particular sectors.
- Sector planning comes into play so that if there is above, below or normal rainfall, some contingency planning is already in place. (suggested best practice)
- (Health) beach contamination is critical at particular times of the year; this information is important for sharing with the public.
- Current JJA outlook helps put planning in place for sector for above normal rainfall.

## Other comments from participants

- Dr. TROTZ (CCCCC): e.g. like drought in 2009; this immediately triggers an understanding of what might happen and what they did or could have been done to cope; "mental map"
- Mr. TROTMAN (CIMH): development of these analogues must go hand in hand with impacts from Climate community and the Sector community.
- Dr. JOHNSON (Ministry of Health, Dominica): we do have the information but we have not been relating it to climate of weather patterns.
- Mr. TROTMAN: part of the work is yours (sectors).

## Breakout Group: Agriculture

- **Issue 1:** Developing a mechanism for coordinating effective communication and interpretation of the products coming out of the met services. What are the systems for monitoring and evaluating the impact of the information- how useful is it?
    - Crucial questions: who requires this information? Farmers, buyers/processors, policy makers?
    - What kind of information does each stakeholder need? Information varies among stakeholders.
- NB: Communication for each stakeholder group will be different so it was important to develop communication tools/packages to fit all levels.

### Information required by Farmers

- Prediction – Daily, Weekly, Monthly – daily should be morning and afternoon;
- Weekly bulletin – updated as you send out the new one;
- Information should be simple and easily understood – How to communicate this information and the medium of communication for the various areas;
- Irrigation and drainage personnel can act on this information - control irrigation;
- Flooding
- Drought
- Level of Irrigation;
- Overtopping of conservancies;
- Daily – work information – spraying, harvesting, fertilizing, land preparation, planting;
- Weekly – fortnightly - longer term planning – planting, land prep, pest and disease, weed management, drainage and irrigation, etc.;
- Monthly – Three Monthly long term – crop selection and markets, pests and disease outlook; weed outlook; drainage.

### Suggested mechanism for Coordination

#### Level 1

Committee made up of Agriculture sector and Met Services that produces two communication packages

- 1. Extension communication package
- 2. policy communication package

#### Level 2

- Extension Services- prepare packages for farmers, and other agriculture stakeholders
- Policy makers – produce package for short term planning and financing

#### Level 3

- Monitoring and Evaluation

### Suggested Communication Media

- Text and voice messaging
- Website
- Newsletter and pamphlets
- Radio

- Newspaper
- Deployment of staff in vulnerable areas to carry message

#### Monitoring and Evaluation

- Extension Staff-Important to conduct continuous training and evaluation to ensure climate and weather information is understood.
- Extension Staff-collect information from farmers through surveys, focus groups, observation.
- Conduct periodic face to face meetings with agriculture stakeholders to get feedback.
- NB: development of data collection instrument very crucial.

**Issue 2:** Look at the forecast and determine the implication for the sector.

#### Impacts and suggested measures

##### **Impacts**

- Landslide
- Flooding
- Pest outbreak
- Loss of crops

##### **Suggested measures**

- Soil conservation
- Securing of livestock
- Securing of forage
- Choice of crops
- Drainage
- Protected agriculture
- Crop insurance

NB: Contingency plan in case the forecast goes the other way-provide water for irrigation, crop insurance.

#### **Breakout Group: Water Improved Coordination**

- Met Director **coordinates** with the hydrologists within the water sector 1. Water production specialists (production planning and rationalization of initial hydrologic conditions) and 2. Water resource managers for medium term hydrologic monitoring. **Recommendation:** Pre and Post meetings for seasonal forecast - This has to be sanctioned among relevant parties.
- **Monthly meetings: outlook forum** focus on seasonal water resources not perennial. Reservoir storage: 25% should remain in storage (ideally). The seasonal forecasts would provide information to model hydrologic input to reservoirs from rivers. Information required prior to water allocation. In Trinidad this is done on a seasonal/annual basis to private water users such as farmers. Climate forecasts can provide some indication of seasonal water availability – possible conjunctive use of ground and surface water resources **Determining the drivers for drought actions and flood prevention and water allocation.**
- **Data sharing:** Barbados (coming soon), St. Vincent, Trinidad and Tobago, and Jamaica – intensity gauges set up in areas of hydrologic importance. Data available to NMS
- **Training** for commonality (trying to speak the same language) and mutual understanding in the use of climate information (meteorologists and hydrologists)

#### **Using the Forecast for the Water Sector**

Above normal conditions (JJA) – high confidence

- Drainage infrastructure cleaned so hydrological flows are not impeded –National Works Agency, Drainage Division (Barbados and Trinidad)
- Water Services Department – improve capacity to treat high volume/turbidity loads associated with heavy rainfall.

Ideal for rainwater harvesting (Dominica and St. Vincent) – decentralized modalities of water supply