The 2023/24 Dry Season Caribbean Regional Climate Outlook Forum (CariCOF)

Roseau, Dominica
Nov29th and 30th

Final Report

1.0 Introduction

Addressing climate change and increasing climate variability are regional and national priorities established by the Heads of Government of the Caribbean Community. Climate variability and change, as exemplified by extreme weather and climate events, such as droughts, floods, heat waves and tropical cyclones, continue to pose significant risks for the Caribbean region. These make early warning information systems critical components of preparedness, risk reduction and adaptation.

Regional Climate Outlook Forums (RCOFs) were first organized in 1997 in response to a threatening El Niño event, to provide seasonal climate information to help decision-makers reduce climate-related risks, develop technical forecasting capacity, and to strengthen connections between science providers and decision-makers. Thanks to the promotion by the World Meteorological Organization (WMO), RCOFs are now active in several parts of the world. The Caribbean Climate Outlook Forum (CariCOF) is a significant step towards providing those relevant and necessary climate information and services to support adaptation and disaster risk reduction in climate sensitive sectors and communities across the Caribbean.

The Caribbean dry season typically has implications for water management and agriculture, with water availability often challenging these two sectors. It is now customary to have participation from practitioners from the water and agriculture sectors for this CariCOF. However, the 2023 dry season CariCOF also focused on the health sector, with Dominica, the host country for this CariCOF, being the target country for climate and health under the Climate Services and Related Applications (ClimSA) programme.

In collaboration with partners from the European Union, the Organization of the African, Caribbean and Pacific States (OACPS), the Caribbean Community Climate Change Centre, the National Oceanic and Atmospheric Administration of the USA, and the Columbia University's International Research Institute for Climate and Society, the 2023-24 Dry Season CariCOF took place November 27th – 30th, 2023 in Roseau, Dominica. The Stakeholder Forum was held on November 29th and 30th featuring 4 sections:

1. The delivery of the regional forecasts for the season (which includes rainfall and temperature forecasts, as well as forecasts of drought and dry spells that limit water availability, wet days, wet spells, extremely wet days and extreme wet spells that provide insight into the potential for flooding), the Atlantic and heatwaves along with sub-seasonal forecasts up to 2 weeks,
2. Multi-Hazard Tournament – a fun and engaging way of collectively responding to climate forecast scenarios reflecting, as closely as possible, real decision-making processes, amongst competing teams,
3. Climate services for the water sector and water users in the Caribbean, with a focus on new research and development activities.

4. Climate services at the national level – national frameworks, climate forums and user interface platforms.

This agenda reflects strides to transition the global RCOF to Regional Climate Forums where the focus moves beyond just the outlooks for the season, but broader climate related issues. Click here to access the 2023/24 Dry Season Concept note. A copy of the agenda can be found in Appendix I and list of participants can be found in Appendix II.

The technical training workshop, often referred to as the pre-CariCOF training of Caribbean meteorologists and climatologists took place on November 27th and 28th, 2023. Training continued with the focus on sub-seasonal forecasting of water-related extremes of dry spells and excessive rainfall (as relates to the potential for flash flood occurrence), as well as monitoring (bush) fire danger that stems from dry conditions.

This CariCOF week culminated on December 1st, 2023, with the inaugural National Climate Outlook Forum (NCOF) for Dominica. The forum was hosted by the Dominica Meteorological Services in collaboration with the CIMH, with financial support from the ClimSA programme. The forum showcased national climate outlooks for the 2023-24 Dry Season and launched the Caribbean ClimSA climate and health programme that would be piloted in Dominica.

2.0 Official Welcome

2.1 Mr. Adrian Trotman, CIMH

The meeting began with an official welcome and featured remarks by Mr. Adrian Trotman from the CIMH and head of the Regional Climate Centre (RCC) for the Caribbean on behalf of the principal and staff of the CIMH. In his address, he welcomed participants across the Caribbean and representatives of the various organizations, regional institutions as well as the media who also play a very important role when it comes to getting messages across. He stated that CariCOF has two meetings, one for the wet and dry seasons respectively each year. He pointed out that there were two challenges addressed during May 2023 CariCOF held in Jamaica - the fact that the presence of an El Nino doesn't mean that hurricane activity would be reduced and the projection that a significantly warmer Caribbean lies ahead, which came to pass, as the heat was significantly felt across the globe.

He also thanked the European Union for their sponsorships towards the water, agriculture and health sectors as well as the National Oceanic and Atmospheric Administration (NOAA) for their support to the forums. Mention was then made about Dominica's upcoming first National Forum on Friday morning, when the focus will be on the likely impacts based on the national forecasts.

2.2 Mr. Ithoma James, Dominica Meteorological Services

Mr Ithoma James, Senior Meteorological Officer (Dominica Meteorological Service) gave his official welcome to all, welcoming climate scientists and stakeholders. He spoke about the impacts of climate change being felt worldwide. He stated that CariCOF serves as a bridge between scientists and stakeholders ensuring that information is provided in a timely manner with shared responsibility and knowledge amongst all, which aids in adequate decision making.

Mr Trotman then pointed out that CariCOF started in 1998, however the actual meetings dwindled until the 2009/10 when an El Niño episode significantly impacted the region resulting in a water crisis. This led to the first CariCOF training for Climatologists and Meteorologists in 2012. He also mentioned that in the Caribbean, we also tend to associate the most impactful disasters with the tropical cyclones, however the most frequent hazard impacting the region is flooding. Hence both CariCOF meetings were hosted to provide information on the two extremes which occur during the wet and dry seasons – albeit more frequently during the wet season.

2.3 Ms. Virginie Andre, European Union Delegation

Ms Virginie Andre from the European Union Delegation (EU) gave greetings virtually on behalf of the Ambassador of the European Union in Barbados whereby she spoke about the importance of reducing climate related risks and the relevance of the dry season in terms of water availability which affects agriculture. Also mentioned was the collaboration between the GCCA+ and ClimSA programs, identifying such collaboration as important as it helps to strengthen the work done as well as support long term goals in terms of reducing vulnerability.

3.0 Presentations

3.1 Dry season Climatology of the Caribbean and Review of recent Impacts in The Caribbean by Mrs Shontelle Stoute, CIMH

In a review of recent climate impacts and the climatology of the Dry Season, Mrs. Stoute highlighted the reported drought impacts from the early 2023 Wet Season. The drought triggered downscaling in agriculture as well as water shortages. Apart from drought, the hot topic was heat. Extreme heat was felt locally, regionally, and globally. During the 2023 Caribbean Heat Season, a broad range of impacts were reported as human and animal health, fire management, energy demand and delivery, and food security were impacted. As a result, public campaigns (supported by UNICEF) began to take shape with the focus of “protecting our children”. Record heat also gave rise to dengue fever outbreaks, which Barbados and other territories are now facing. Record warm Atlantic Sea Surface Temperatures (SSTs) caused (i) heat stress on live corals and likely widespread coral bleaching and (ii) fueled the busy peak of the Atlantic hurricane season with 20 tropical storms, of which 7 were hurricanes, 3 of which were major hurricanes.

In her review of the typical Dry Season, Mrs. Stoute indicated that the season typically runs from December to May, but the start and end can vary depending on the location across the region. The southward migration of the Inter-Tropical Convergence Zone along with the cooler SSTs gives rise to decreased thunderstorm and rain shower activity. It was also noted that the dry season generally accounts for 20 – 30 per cent of the annual rainfall total. In addition, the Dry Season is not exempt from Tropical Cyclones, as previous occurrences have been observed.

3.2 Dry Season Climate Outlook (rainfall, temperature, wet days/wet spells, drought, dry spells), by Dr. Cédric Van Meerbeek, CIMH

In the delivery of the 2023/24 Dry Season Forecast, Dr. Van Meerbeek gave the following summary:

With a look at recent conditions:

- **There has been excessive heat** and multiple impacts of heat stress in the human populations, on the environment and in livestock across the region during the 2023 Caribbean Heat Season.

December 2023 – January - February 2024 (early dry season)

- Faster than usual decrease in rainfall and wet days towards the end of February predominantly along the southeastern part of the region.
  ➔ faster than usual decrease in surface and soil moisture.
- Flash flood and long-term flooding potential decreasing from *moderate to high* in December to *marginal* by February in the islands and Belize, but *high* until early-February in the Guianas.
- Flood potential *very low* in the week of 28 November to 5 December.
- Drought concerns arising in northwest Belize, southern French Guiana, Grenada, western Puerto Rico and Suriname, but also possible in most other areas.
- Frequent dry spells expected westward of Puerto Rico throughout the season, but only from February in other areas.
- Growing rainfall deficits are likely through the period 28 November to 5 December.
- No heat discomfort during this period marking the cool season.
- Though even fewer than usually, the sparse cold night may be expected, particularly in Belize, Guyana, and across the northwest section of the region and at higher elevations elsewhere.

March – April - May 2024 (late Dry Season)

- Heat stress to return in the vulnerable population & small livestock from April (Belize, Cuba & Trinidad) or May (elsewhere), with the possible exception of areas that end up much wetter than usual.

- Long-term Drought concerns arising in Belize, southern French Guiana, and southwest Puerto Rico.
- Annual peak in frequency of dry spells in the Caribbean Islands and Belize and some dry spells in the Guianas until April.
- Shower frequency relatively low during the second half of the dry season.
- Rainfall intensity (when it does rain) to likely increase towards May.
- Flash flood and long-term flooding potential *limited* in March but to significantly *increase* from April in the Greater Antilles, and May in Belize, the Guianas and the Lesser Antilles.

** participants were encouraged to stay tuned as information is updated for each month on rcc.cimh.edu.bb.*

3.3 2023/2024 Dry Season CariCOF Multi-Hazard Tournament (Dr. Roché Mahon and Ms. Jodi-Ann Petrie, CIMH)

After the delivery of the 2023/24 Dry Season Outlooks, Dr. Roché Mahon and Ms. Jodi-Ann Petrie introduced the 2023/2024 Dry Season CariCOF Multi-Hazard Tournament (MHT). The MHT captured the opportunity to exercise the climate monitoring and forecast suite that was just presented by the climatology team in a scenario that was meant to connect the implications of the risk information to real life decision-making. More specifically, the goal of the tournament was to simulate how to apply available historical climate, climate monitoring, and climate forecast information in a national, cross-sectoral planning context.

In order to do this, participants were divided into 5 teams of 10 to 15 persons each. Each group was provided with a guideline playbook for the tournament describing the tournament scenario for the fictitious tri-Island state of Caribe Isles, comprised of St Caribe, St Allen and St Kirton. Teams were provided with a suite of historical climate impacts maps, climate monitoring products, and the current 3-6 month suite of SCFs for the fictitious country.

Teams were required to represent their Ministry/Department on a newly constituted multi-sectoral National Committee for Climate Services to co-develop a USD 2 million cross-sectoral Climate Risk Management (CRM) plan for: the early 2023/2024 Dry Season (DJF 2023/24); and the late 2023/2024 Dry Season (MAM 2024) for the tri-island state of Carib Isles using the provided template. After co-developing the plan, teams were required to effectively present the CRM plan to the Carib Isles Ministerial Council and the nation in a televised broadcast later that day.

Each team delegated responsibilities such as:

- Team spokesperson: ensured team completes required task and presents CRM strategy on behalf of the team;
- Recorder: recorded strategies on provided PPT template;
- Budget keeper: tracked team's budget; and

- Timekeeper allocated and closely monitored time allowed for the exercise.

Much discussion took place between the members of the 5 teams. Their recommended actions were later judged by a panel of CIMH referees after presentations from each of the 5 groups.

This was followed by a mentimeter voting segment where each MHT participant has the opportunity to vote for "The People's Choice CRM Plan", as well as "The People's Choice Presenter". The Peoples' Choice CRM Plan was produced by Group 1 while the People's Choice Presenter was voted to be Dr. Laura-Lee Boodram of CARPHA. The overall winner of the 2023-2024 Dry Season Caribbean Climate Outlook Forum Multi-Hazard Tournament chosen by the CIMH panel of judges was Group 4.

The teams were judged against the scoring matrix below:

SCORING CRITERIA	SUCCESS METRICS	WEIGHT
1. Spatial justification of adaptation choices	Select the adaptation options most appropriate to different scales	10
2. Temporal justification of adaptation choices	Consider the CRM plan implementation timeline; Select the adaptation options most appropriate to different timelines	10
3. Assignment of implementation responsibility to Local, Parish, and National Decision-Makers	Consider who does what at local, Parish, and National levels	10
4. Explanation of how the team used climate monitoring information in its selection of adaptation measures	Interpret the suite of climate monitoring products	10
5. Explanation of how the team used *SCFs* in its selection of adaptation measures	Interpret the suite of seasonal climate forecasts	10
6. Explanation of how the team used historical climate impact maps in its selection of adaptation measures	Interpret the suite of historical climate impact maps	10
6. Explanation of the decisions that could not be made with the current climate monitoring, SCF and historical climate maps formats and what they need to address those gaps in the SCF?	High quality recommendations of or improvement of the available suite of climate risk information to improve decision-making	10
7. Innovative adaptation options (eg. feasible and effective adaptation options not on the option menu; integration of traditional knowledge and indigenous climate adaptation options)	Integration of options outside of the suggested menu of adaptation options compiled by the Secretariat of Carib Isles' Ministerial Council	10
9. Quality/level of cross-sectoral team interaction/collaboration	Presentation of high quality cross sectoral CRM plan	10
10. People's Choice score	Clear, engaging presentation to the Ministerial Council	10

Members of the winning team were celebrated and presented with laptop sleeves and t-shirts complements of the Intra ACP Climate Services and Related Applications (ClimSA) Caribbean Programme which is an initiative funded by the European Union.

3.4 Hydrometeorological Services for the Water Sector - Sponsored by the Intra-ACP GCCA+ Programme in the Caribbean: Enhancing Climate Resilience in Cariforum Countries, executed by the Caribbean Community Climate Change Centre, and funded by the European Union. (Shawn Boyce, Chief Hydrologist, CIMH)

In his presentation, Mr. Boyce focused on Output 2.2 of the task, which is to provide a framework for linking water utility operational practices with real-time weather forecasting and Early Warning Systems (EWS). An EWS is defined by the United Nations Office for Disaster Risk Reduction (UNDRR) as:

> *"an integrated system of hazard monitoring, forecasting and prediction, disaster risk management, communication and preparedness activities systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events"*

Mr. Boyce presented how the integration hazard and exposure data can improve decision making within utilities and water resource management agencies and demonstrated workflows for integration. He also gave some important definitions (Figure 1) used among risk reduction practitioners.

Concept	Definition
Hazard	*A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation. Hazards are characterized by their location, intensity or magnitude, frequency and probability.*
Exposure	*The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas. Measures of exposure can include the number of people or types of assets in an area.*
Vulnerability	*The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards.*
Capacity	*The combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience.*
Coping Capacity	*Coping capacity is the ability of people, organizations and systems, using available skills and resources, to manage adverse conditions, risk or disasters.*
Resilience	*The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management.*

Figure 1: Definitions

Participants also viewed a video on RASOR (Rapid Analysis and Spatialization of Risk), which demonstrated how flood risk may be quantified especially when exposure data are incorporated. The overall objective of the task is to integrate water utility physical asset data within the Caribbean Dewetra Platform (CDB) to demonstrate a framework for assessing risk through merging with hazard forecasts and near real-time observations.

Mr. Boyce provided a demonstration and facilitated a brief discussion on data availability. The CDP is an impact-based forecasting, data fusion platform that brings together hazard and exposure data in an online environment for rapid decision-making purposes.

3.4 b Seasonal and Sub Seasonal prediction of Rainfall Extremes, by Dr. Simon Mason, IRI , and Dr. Cédric Van Meerbeeck, CIMH

Dr Simon Mason's primary forecasting focus was what would happen in the next 1 to 4 weeks - i.e., up to the final week in December. Dr. Mason asked the question how well can we predict hot days 3 days in advance. He stated that these types of forecasts made in North America and Asia are very good, however much harder to make in the tropics and the Caribbean. His focus turned to looking at how well we can forecast in the next few weeks as opposed to 3 days, a timescale commonly referred to as 'sub-seasonal' or, alternatively, 'sub-seasonal to seasonal' (S2S). He mentioned that forecasts looking 2 to 4 weeks ahead nowadays can be made with useful skill, in stark contrast to only 20 years ago. This improvement is particularly valid in the tropics.

He then introduced the Madden Julian Oscillation (MJO) as the most important and partly predictable driver of sub-seasonal time scale climate variations. He explained that the MJO is a slow eastward movement of large areas of heavy rainfall, moving towards the east in the tropics taking 1 to 2 months for a cycle to repeat itself, however stating that it is not well defined in the Caribbean.

He then shifted the focus back to sub-seasonal forecasts. He stated that efforts on forecasting at this scale started off in a research mode but is now becoming operational. He mentioned that the World Meteorological Organization (WMO) is trying to get global producing centers to forecast at these timescales for the global community.

He concluded that temperatures for the period Dec 7th to 13th were forecasted to be mostly warmer than normal for the Caribbean for this time of year, as indicated by the model. In the case of rainfall, for the same period, the northern part of the Caribbean could experience a bit more rainfall than normal, however, the forecast is for an increased likelihood of drier conditions in the south.

Dr Cédric Van Meerbeeck looked at the approach of climate services for water management, starting by posing the question "Why climate services?" What is gained out of climate services? He commented that there is provision of climate information for decision making to build resilience against hazards as well as to enable one to take advantage of favorable climate conditions.

He pointed out that there are two major types of climate-related decision-making processes that help build climate resilience, each related to a specific range of information time scales. Long term adaptation, best known as a strategy to build resilience to Climate Change, was juxtaposed with early warning information for preparedness, alerting and response, comprising of the weather, sub-seasonal and seasonal time scales.

Seasonal forecasts are presented ahead of the season. They look ahead at the next few months to year ahead to estimate the level of risk of impending hazards compared to other years, but cannot identify the expected timing of that hazard during the forecast period.

In addition to the information potentially contained in seasonal forecasts, sub-seasonal forecasts aim at providing the earliest advanced notice of the timing of a potential hazard. Mention was also made about a weather time scale giving more detail as to where, how strong and how will it affect us in different communities.

After providing a summary of the list of climate early warning products provided by the Caribbean RCC and National Meteorological and Hydrological Services in the Caribbean, Dr. Van Meerbeeck stated that monitoring and forecasting of weather and climate information will aid the water sector to better manage the resources and their distribution, as well as water allocation and use in other sectors. He stated that the aim is also to develop outlook forums for the water sector, with hydrologists, climatologists and water managers working together and co-producing information in the future.

In the last part of this session, Dr. Wazita Scott presented a range of prototype, regional sub-seasonal forecasts of rainfall totals, dry day counts and flash flood potential for "week 2", i.e., the 7-period starting 1 week after the CariCOF Forum. These forecasts were produced with a method developed under a long-standing partnership between the IRI and the CIMH and put to practice the methods which regional meteorologists were trained in during the two-day technical training workshop ahead of the CariCOF Forum.

As was previously alluded to by Dr. Mason, week 2 was forecasted to be more akin to dry season conditions in most of Belize and the Caribbean islands: reduced rainfall intensities and frequency were expected in most areas, with the resulting flash flood potential being limited in most of these areas. By contrast, rainfall intensity and frequency would be higher in the northern and eastern parts of the Guianas - which just entered their secondary wet season – resulting in moderate to high flash flood potential there.

A brief discussion rounded off the session. The IRI and CIMH presenters steered the discussion with the aim to receive feedback on the presentation of – i.e., look and feel – and potential usefulness of each of these types of sub-seasonal forecasts among the water sector representatives, as well as other parts of the audience.

3.5 Hydrological Drought: Its Occurrence and Effects on Caribbean Countries by Ms. N Veronica Yearwood (Hydrologist Antigua Public Utilities Authority) and Mr. Adrian Trotman, CIMH

In Ms. Yearwood's presentation she first defined a Hydrological Drought - this occurs whenever a low water supply becomes evident, particularly in streams, reservoirs and groundwater levels, occurring after many months of a Meteorological Drought. She added that the frequency and severity of this type of drought is often defined on a watershed or a river basin scale.

A diagram depicting the Hydrological Cycle was then shown, with arrows indicating the areas of groundwater, surface storage and surface water accumulations resulting from infiltration and runoff due to precipitation as well as the occurrences of evaporation and transpiration which altogether make up the Hydrological cycle.

Ms. Yearwood's focus was then turned to Antigua whereby she showed a map of Bendals well field in Bendal's village pointing out the parameters used at Bendal's in identifying a Hydrological Drought, such as low rainfall, salinity, evaporation and evapotranspiration, just to name a few. She stated that Antigua is presently looking at the occurrence of a long drought but then asked the question as to whether the drought was severe enough to be considered as a Hydrological drought. She highlighted some of the observations made in the field such as there being a 2.5 to 3 months lag in the response to rainfall before observing water level rise in the observation wells.

Apart from Meteorological and Hydrological droughts as mentioned earlier, she pointed out that there can also be Agricultural drought resulting from low soil moisture as well as socio economic drought due to loss of farmers income or a lack of potable water. She concluded that there is a need for forecasting of Hydrological drought because when the lack of precipitation has reached the stage of a hydrological drought, this can be considered the worst case as it would have exceeded a Meteorological, Agricultural and socio-economic drought.

Mr. Trotman then addressed the question of how the Regional Climate Centre's drought products can help, by turning our attention to some of the monitoring and alerting tools produced. Rainfall and drought are monitored using the Standardised Precipitation Index (SPI) and the Standardised Precipitation and Evapotranspiration Index (SPEI). Mr. Trotman also showed short- and long-term drought driven by forecasting rainfall that translated into forecasts of severity of drought levels for 6 and 12 months respectively, using the SPI. From these, alert levels are displayed suggesting to meteorological services what they may consider in advising the relevant authorities as to whether drought watches, drought warnings, or drought emergencies should be issued or not. He asked the question "How these products can be tailored for the water and other sectors?" He proceeded by asking further questions such as "How do we tailor the generic drought early warning products for the water (and other) sectors?" At what values/thresholds of the index, and after what duration do we observe significant impacts in the agricultural sector? When such values/thresholds are forecasted (probability of reaching/exceeding), can we suggest to the sector the level(s) and type of impact(s) that is/are likely? Or…are current products good enough as they are for decision making in the sector? Also, based on likely/potential impact(s) in the sector, can these established relationships support drought planning in the sector? He clearly emphasized that these are the types of questions which need to be answered when it comes to developing drought management plans for the various sectors. He also added that relationships need to be established between the drought index and impacts on the ground.

Mr. Trotman also indicated that there needs to be high level support for the drought plan, asking if these criteria can be met. He concluded by stating that similar work was attempted in the agricultural sector in Saint Lucia and Grenada, but asked the question "Is data available?." This was the biggest gap in trying to establish a link between the value of drought index and the impacts on the agriculture sector.

3.6 An Introduction to the Climate Information Education and Tools (CLIEn'T) Portal Framework: Tools to support risk management and climate change programmes (Alpha version) by Jayaka Campbell (CSGM, UWI)

Evidence has shown that our climate in the Caribbean has changed: temperatures have increased; rainfall has become more variable; sea levels have risen; and climate extremes (e.g. droughts, intense storms) have increased in frequency. Moreover, our climate will continue to change. In this regard, the challenge is "how do you build resilience when there is no time to recover from one event before experiencing another?". This can have a significant impact on a country's Gross Domestic Product (GDP) and there is need for SMART action (Figure 2) since climate change impacts are intersecting negatively with our development goals.

Figure 2: SMART Action

Out of this concept, the CARIWIG (Caribbean Weather Impacts Group) project was birthed since action needed to be information driven. In collaboration with regional stakeholders, an intuitive web-based platform was developed which provided easy access to Caribbean data to support climate information needs. As a result of the experiences and challenges of CARIWIG the CLIEn'T (Caribbean Climate Information Education and Tools) was developed. The CLIEn'T has three main tools which would offer services for historical data, future data and simulations. Within the simulations section there will be several tools such as (i) the CARIDRO (Caribbean Drought) tool which will process climate data to produce indices; (ii) the SMASH-tropical storm model which is a simple advection model based on past memorable and notable storms across the region; and (iii) the DICE-extreme deciles calculator which uses historical data and future projections to track and analyze climate extremes.

3.7 Enhancing the WMO Guidance and Support towards National Frameworks for Climate Services by Nicola Golding (UK-Met; WMO ETCID)

In her presentation, Mrs. Golding highlighted one of the long-term goals of the World Meteorological Organization (WMO), which is to better serve societal needs. The GFCS (Global Framework for Climate Services) is a WMO initiative with a vision to "enable society to manage risks and opportunities arising from climate variability and change". To achieve this the GFCS seeks to (i) strengthen climate service capacity and capability, particularly to National Meteorological and Hydrological Services (NMHSs); (ii) support climate policy and finance with authoritative scientific information; (iii) develop standards, quality management and training; (iv) develop the climate services value chain/cycle; and (v) improve visibility and effectiveness of GFCS, promote coordination.

The WMO describes a National Framework for Climate Services (NFCS) as a:

> *"National mechanism to bridge the gap between the climate information being developed by scientists and service providers on the one hand, and the practical needs of users on the other hand."*

The NFCS aims to coordinate institutions and enables them to work together across the value cycle to co-design, co-produce, communicate, deliver, and use climate services for decision-making in sensitive sectors.

With the hierarchical structure of information and services, Mrs. Golding emphasized that it is important to strengthen the flow of information/benefits down to the national level to enable decision-making and the use of climate information effectively.

3.8 Climate Services at the National Level in the Caribbean – Where from Here by Adrian Trotman, CIMH

The GFCS was embraced by the Caribbean region in 2013. However, Mr. Trotman in his presentation stated that the question is "How well have we embraced it?" and "How well have we been doing at providing services for our sectors and populations?". With the key players at the national level (NHMSs and climate sensitive sector representatives at the national and regional level) present, Mr. Trotman asked the question of "How can we work together to continue to develop climate services?". He further presented the current Step-by-Step Guidelines for establishing a NFCS (Figure 3), published by the WMO.

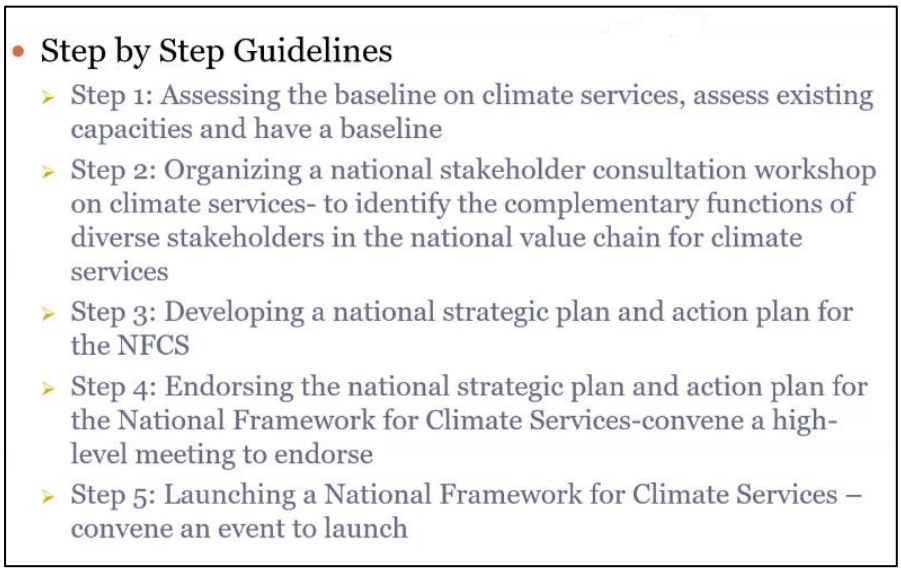

Figure 3: Step by Step Guidelines for Establishing A National Framework for Climate Services

Encouragingly, the Caribbean region has already been achieving these steps in the regional approach to providing climate services from as early as 2013 (Figure 4 below shows the achievements of the Caribbean regional approach to Climate Services).

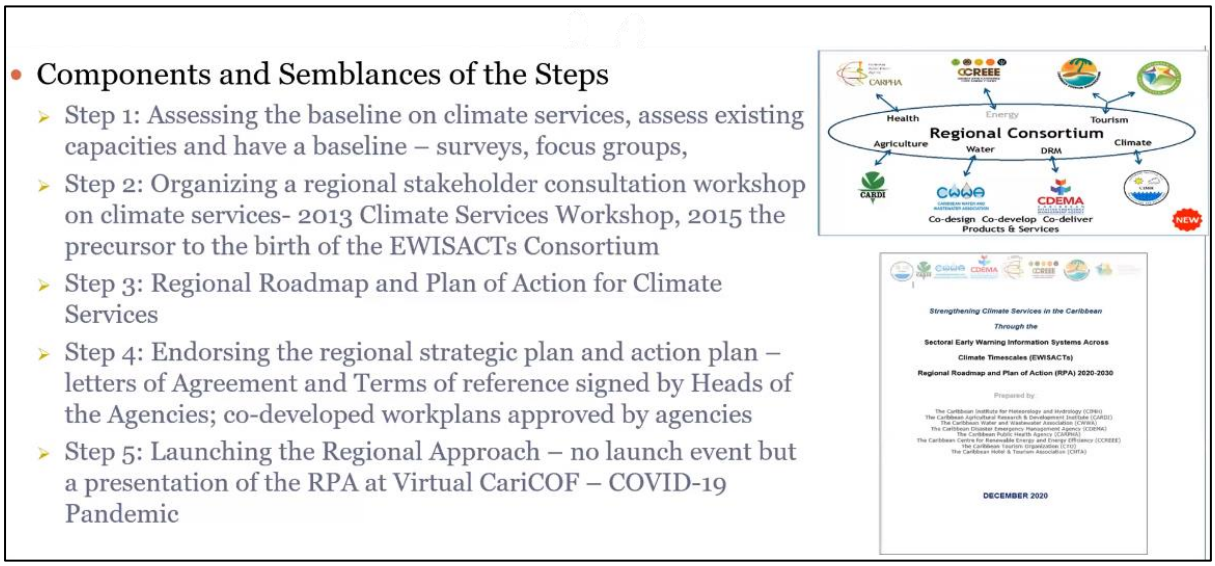

Figure 4: Caribbean Framework for Climate Services

In an effort to effectively deliver climate services at the regional level, the EWISACTs[1] Consortium was established. It would be beneficial to have a similar structure at the national level for climate services. Whichever approach the country takes, the consortium/committee

[1] Early Warning Information Systems across Climate TImescales

should focus on governing how the country delivers its climate services. Other elements beneficial to a NFCS would be to have a National Roadmap and Plan of Action (RPA), National Climate Outlook Forums (NCOFs), and national sector-specific bulletins. Having these elements are not far fetch with RPA testing in Grenada, Saint Lucia and St. Vincent and the Grenadines and exploring national climate services committees.

Some countries had developed Strategic Plans and National Frameworks for Weather, Water and Climate Services, and Mr. Trotman advised that these could be reviewed and used as the framework documents.

4.0 Summary and Close Out by Adrian Trotman, CIMH

In the closing of the 2023/24 Dry Season CariCOF, Mr. Trotman thanked everyone for participating in the multi-hazard tournament as well as for their contributions over the past two days. The tournament was exciting and congratulations goes to Goup 4 for being declared the winners (Figure 5).

Figure 5: Coordinators/Referees (seated) and winning group 4 of the 2023/24 Dry Season CariCOF Multi-Hazard Tournament

Mr. Trotman expressed the hope that the region will build better meteorological services by increasing and enhancing services provided. In an effort to make the science of meteorology more palatable to young scientists, there must be an expansion of services from just aviation and weather forecasting. Thus, Mr. Trotman encourages the region not to be left behind.

Appendix I: 2023/24 Dry Season CariCOF Agenda

The 2023-24 Dry Season Caribbean Climate Outlook Forum
(CariCOF)
Stakeholder Forum
State House, Victoria Street, Roseau, Dominica
November 29th – 30th, 2023

AGENDA

DAY 1

TIME	SESSION	PRESENTER/FACILITATOR
0900 - 0940	Welcome and Featured Remarks	Adrian Trotman (CIMH) Ithoma James (Dominica Met) EU Delegation (Virtual) Hon. Rayburn Blackmoore, Minister of National Security and Legal Affairs
0940 - 1000	Dry Season Climatology of the Caribbean & Review of recent impacts in the Caribbean	Shontelle Stoute, CIMH
1000 – 1020	Dry Season Climate Outlook (rainfall, temperature, wet days/wet spells, drought, dry spells)	Cedric Van Meerbeeck (CIMH)
1020 - 1030	Open discussion on the Seasonal Forecast	
1030 – 1050	COFFEE BREAK	
1050 – 1230	Multi-Hazard Tournament	Roche Mahon & Jodi-Ann Petrie (CIMH), All
1230- 1330	LUNCH	
1330 - 1445	Multi-Hazard Tournament	Roche Mahon & Jodi-Ann Petrie (CIMH), All
1445 - 1500	COFFEE BREAK	
1500 - 1555	Multi-Hazard Tournament	Roche Mahon & Jodi-Ann Petrie (CIMH), All
1555 - 1600	Close of Day 1	Adrian Trotman (CIMH)

DAY 2

TIME	SESSION	PRESENTER/FACILITATOR
0900 – 0910	Welcome & Recap of Day 1	Lisa Kirton-Reed (CIMH)
0910 – 1015	Caribbean Dewetra Platform: Impacts Based Forecasting and Early Warning for the Water Sector – an Update	Shawn Boyce (CIMH)
1015 – 1030	Q&A	All
1030 – 10:45	COFFEE BREAK	
1045 – 1150	Seasonal and Sub-seasonal Prediction of Rainfall Extremes	Simon Mason (IRI), Cedric Van Meerbeeck (CIMH)
1150 – 1205	Q&A	All
1205 – 1245	Hydrological Drought: Its Occurrence and Effects on Caribbean Countries	Veronica Yearwood (APUA, Antigua), Adrian Trotman (CIMH)
1245 – 1345	LUNCH	
1345 – 1445	An Introduction to the Climate Information Education and Tools (CLIEn'T) Portal Framework: Tools to support risk management and climate change programmes (Alpha version)	Jayaka Campbell (CSGM, UWI)
1445 – 1500	COFFEE BREAK	
1500 - 1530	Enhancing the WMO Guidance and Support towards National Frameworks for Climate Services	Nicola Golding (UK-Met; WMO ET-CID)
1530 – 1545	Climate Services at the National Level in the Caribbean – Where from Here	Adrian Trotman
3:45 – 4:00	Summary and Close-out	Adrian Trotman

Appendix II: Participant List

	Organisation	Last Name	First Name	Email contact
1	Antigua	Humphreys	Charissa	charissa.humphreys@gmail.com
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24	CIMH	Trotman	Adrian	
25	CIMH	vanMeerbeeck	Cédric	

	Organisation	Last Name	First Name	Email contact
26	CIMH	Stoute	Shontelle	
27	CIMH	Kirton-Reed	Lisa	
28	CIMH	Applewhaite	Andrea	
29	CIMH	Scott	Wazita	
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43	CIMH	Petrie	Jodi-Ann	
44	CIMH	Frederick	Sherri	
45	CIMH	Deane	Lyn-Marie	
46	CIMH	Boyce	Shawn	
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