8. ADDING VALUE TO CLIMATE INFORMATION THROUGH SERVICES

8.1. INTRODUCTION

8.1.1. CARIBBEAN CLIMATE AS RISK AND OPPORTUNITY

The main sectoral drivers of socio-economic development of Caribbean States remain highly reliant on and sensitive to the dynamics of Caribbean climate (See Chapter 7). For example, in a region that is the most tourism dependent in the world (WTTC 2016), tourism offerings are promoted year round due to average annual temperatures in the general range of 24°C-32°C - ideal for recreation and visitor comfort. Moreover, in a region dominated by rain-fed agriculture, for most rain-fed crops, the growing season spans the wet season, from May to November, with the type of crops and cultivars usually selected to match anticipated rainfall (Mahon et al. 2015a). Irrigation sources such as ponds, streams and rivers which are also influenced by climate add to the length of the growing season in many parts of the region.

Regional experience shows that most states bear a heavy public debt burden, brought on in large measure by losses incurred and costs of recovery efforts after major weather and climate events (CARICOM 2017). Key sectors within states are particularly sensitive to the impacts of climate variability and extremes. For example, periods of excessively high rainfall or droughts have historically had devastating consequences on Caribbean economies. For droughts, insufficient water supplies have led to crop failure, the increased incidence of bush fires, the proliferation of vector-borne diseases, reduced industrial activity and decreased energy production (Lowe et. al. 2018; Trotman et al. 2017; Farrell et al. 2010). On the other hand, extreme wet spells and floods have led to landslides, damage to property, displacement of populations and failure of critical infrastructure such as roads and bridges (Mahon et al. 2015a).

8.1.2. THE NEED FOR ADDING VALUE TO CLIMATE INFORMATION THROUGH SERVICES

The need to reduce the adverse impacts of climate and enable critical revenue generation and cost saving activities presents a compelling case for the production and use of tailored, user-driven climate information which form the basis of value added climate services. *Climate information* refers to knowledge and advice about the past, present and future characteristics of the Earth's system (as discussed in detail for the Caribbean in Chapters 2 to 7). C*limate services* involve the preparation and delivery of climate information to meet users' needs (WMO, 2011). Climate services add value to generic climate information by tailoring the interpretation of this information for specific application to sectoral decision-making. The development and delivery of climate services therefore requires significant interaction and/or partnership among providers, researchers and users of climate services to transform climate information by blending climate knowledge with sector-specific knowledge into user-oriented climate services (WMO 2018). By tailoring climate messages to include a specific and targeted sectoral focus, the usefulness and usability of the information for sectoral application is enhanced, and end-user uptake and use is catalysed.

Climate services can play a key role in facilitating the Caribbean's transition to a resilient future by enabling sectoral decision-makers to engage in a systematic and coordinated process of using climate information to reduce related risks and to take advantage of opportunities to improve resilience. This is at the core of climate risk management (Martínez et. al. 2012).

8.1.3. THE GLOBAL FRAMEWORK FOR CLIMATE SERVICES

Though climate services is a young and growing field, the awareness of the importance of climate services to support decision-making has grown particularly since the Third World Climate Conference (WCC-3) in 2009. WCC-3 drove the establishment of the WMO-led Global Framework for Climate Services (GFCS) in 2009 (WMO 2011) to guide the development and application of science-based climate information and services in support of decision-making in five priority climate-sensitive sectors (WMO 2017). These are the agriculture and food security, water, health, disaster risk reduction and energy sectors. The GFCS can be seen as an international response to the need for more user-driven climate services (Vaughan and Dessai 2014). As a framework, the GFCS is built upon five pillars that individually and combined, support essential elements for the development and delivery of climate services to a range of user groups (WMO 2011) (Figure 8.1). The function of each GFCS pillar is described in Table 8.1.

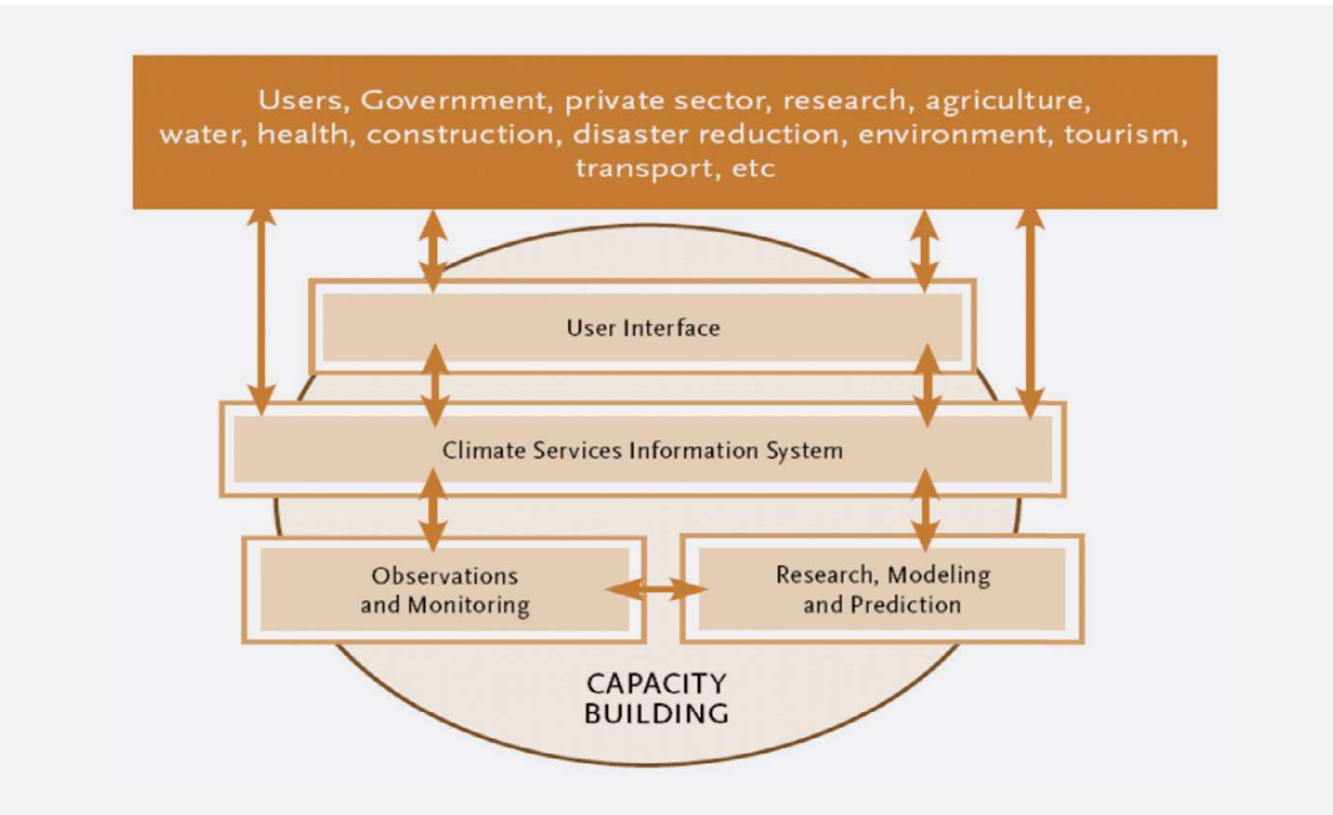


Figure 8.1: Conceptual model of the GFCS' five pillars. Source: WMO, 2011.

Table 8.1: The Functions of the Five GFCS Pillars. Source: WMO, 2011.

PILLAR	FUNCTION
OBSERVATIONS AND MONITORING	Generates the necessary data from which climate information products and services are built
RESEARCH MODELLING AND PREDICTION	Advances the science needed for improved climate services that meet user needs
CLIMATE SERVICES INFORMATION SYSTEM (CSIS)	Supports the mechanisms through which information about climate (past, present, and future) is routinely collected, stored, and processed in ways that enable the generation and distribution of products and services
USER INTERFACE PLATFORM (UIP)	Facilitates a structured means for users, climate researchers and climate information providers to interact at all levels ensuring that climate services are relevant to user needs
CAPACITY BUILDING	Supports the systematic development of the institutions, infrastructure and human resources needed for effective climate services

8.2. THE CARIBBEAN APPROACH TO CLIMATE SERVICES

Since its inception in 1967, the Caribbean Institute for Meteorology and Hydrology (CIMH) - the technical arm of the Caribbean Meteorological Organization (CMO) – in association with its constituency of National Meteorological and Hydrological Services (NMHS) in 16 CMO States has been building the regional and national observational network of in situ surface data instruments and archiving the acquired data that form the foundation for the production of climate information and services.

With the establishment of its Applied Meteorology and Climatology (AM&C) Section in 2007 dedicated to advancing science-based applications of climate data, the CIMH has cumulatively invested in upgrading the Caribbean's climate research, modelling and prediction capabilities at regional and national levels, which led to its designation by the WMO as the Regional Climate Centre (RCC) for the Caribbean. Through coordinated research networks such as the Caribbean Drought and Precipitation Monitoring Network (CDPMN) and the Caribbean Climate Outlook Forum (CariCOF), since 2009, the routine production of a range of generic, regional climate-oriented monitoring products and consensus long-range (seasonal) forecasts has been catalyzed and sustained.

Over time, the suite of operational products has increasingly included early warning information on climate variables that have implications for a range of sectors. These include information on drought and dry spells, heat wave days, and extreme wet spells (see Chapter 6 for a detailed description on those information products). In 2014, the CIMH established its regional programme on Early Warning Information Systems across Climate Timescales (EWISACTs). The aim of EWISACTs is to deliver climate information and services to alert stakeholders in Caribbean climate-sensitive sectors and general public entities of potential risks due to a range of climate hazards including extreme events, across timescales from daily, monthly to seasonal and multi- decadal.

The Caribbean approach to sectoral EWISACTs development embraces all five pillars of the GFCS, as well as the five global priority sectors and ultimately contributes to regional level implementation of the GFCS. The Caribbean programme also prioritizes services to the tourism sector, which is of great economic importance to the region. In this way, for the region, tourism is a sixth priority sector.

8.2.1. THE SECTORAL EWISACTS PHILOSOPHY AND METHODOLOGY

The Sectoral EWISACTs programme embraces the philosophy of Pulwarty and Sivakumar (2014) in providing climate early warning information with tailored communication of sector-specific risks and recommendations for sectoral action in response to the information. Three principles guide the sectoral EWISACTs development process: (i) better use of existing data and information platforms; (ii) maximizing of synergies between climate and sectoral activities; and (iii) partnership and consultation for climate services (Figure 8.2).

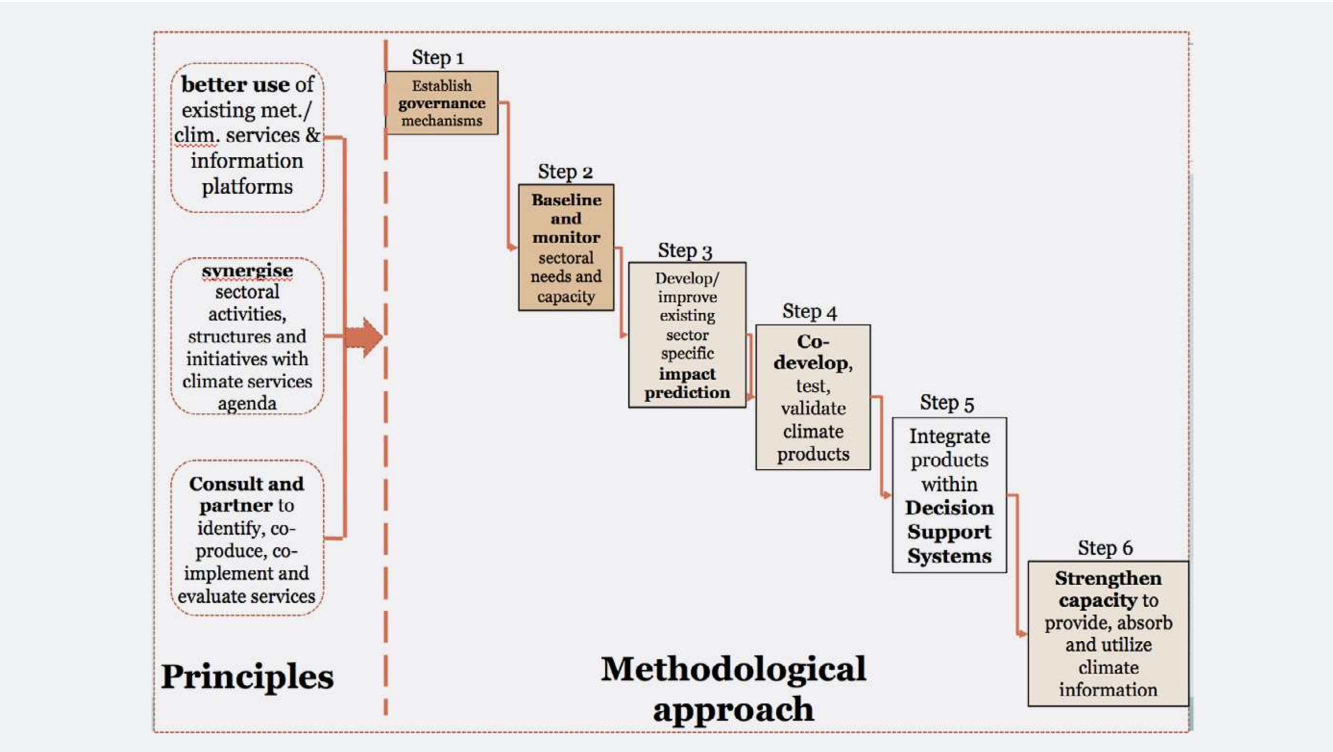


Figure 8.2: Methodological approach to the co-design, co-development and co-delivery of climate services in the Caribbean. *(Shading indicates progress made to date at varying degrees of implementation).* Source: Mahon et al (2015a)

Collectively, the six-step methodological process highlights the *co-design*, *co-development* and *co-delivery* of sector-specific climate services using innovative and sophisticated modelling and prediction techniques in tandem with a highly participatory and inter-disciplinary workflow that engages user communities at all stages of the climate services value chain (Mahon et. al. 2015a). It is a co-production process that at its core is underpinned by the principle and practice of *partnership and consultation to add value to generic climate information through services*.

STEP 1: ESTABLISH GOVERNANCE MECHANISMS: THE SECTORAL EWISACTS CONSORTIUM

One of the keys to the success of the sectoral EWISACTs programme was the early establishment of a representative stakeholder governance mechanism at the regional level (Mahon et al. 2015a,b). The Consortium of Regional Sectoral Early Warning Information Systems across Climate Timescales Coordination Partners was established in 2017 under the USAID-supported Building Regional Climate Capacity in the Caribbean (BRCCC) Programme (2014-2017) as a multi-agency alliance for climate resilience and a high level manifestation of a formalized UIP.

The arrangement leverages the technical resources and expertise of lead technical organizations such as the Caribbean Agricultural Research & Development Institute (CARDI), the Caribbean Water and Wastewater Association (CWWA), the Caribbean Disaster Emergency Management Agency (CDEMA), the Caribbean Public Health Agency (CARPHA), the Caribbean Tourism Organization (CTO) and the Caribbean Hotel and Tourism Association (CHTA) (Figure 8.3).

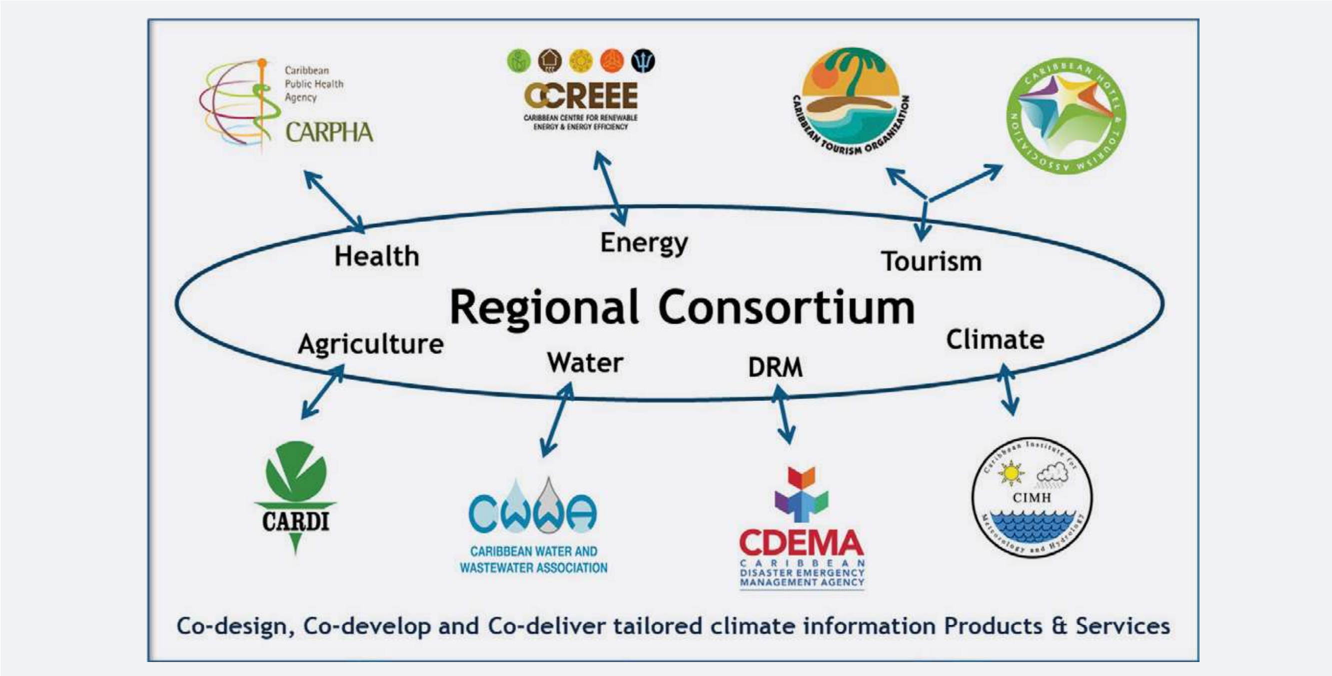


Figure 8.3: The Consortium of Regional Sectoral EWISACTs Coordination Partners. Source: Mahon et al (2018).

Individual Consortium members serve hundreds of sectoral practitioners through multi-faceted initiatives in the six Caribbean prioritized sectors, and as such, are well positioned to inform and influence sectoral decision-making at regional and national levels. Importantly, as a formal, inter-sectoral collaboration mechanism, the Consortium arrangement allows for the identification of areas of joint complementary work and overlapping interests as a basis for partnership (CIMH et al. 2015; Mahon et al. 2015a,b).

STEP 2: BASELINE AND MONITOR SECTORAL NEEDS AND PROVIDER CAPACITY

Since 2015, CIMH has invested in a comprehensive baseline assessment of user needs and provider capacity (Mahon & Trotman 2018; Mahon et al. 2019). This assessment has since informed product tailoring and capacity development for sector-specific applications. For example, it is now clear that very few NMHSs are engaged in producing specialized products for major sectors mainly because they lack the capacity to do so. On the end-user side, the research revealed that a significant number of end-users are unaware of key climate information tools and products that are routinely available to them. There is also differentiated ability across end-user communities to interpret and use climate information.

STEP 3: DEVELOP/IMPROVE EXISTING SECTOR SPECIFIC IMPACT PREDICTION

The development of sector-specific climate-driven monitoring and forecasting models is inherently complex and must be anchored in a robust knowledge of climate thresholds for sectoral operations. A core future task for the Caribbean will be the collection and the integration of socio-economic indicators from sectoral surveillance/monitoring with climate and environmental observations (Mahon et al. 2015b).

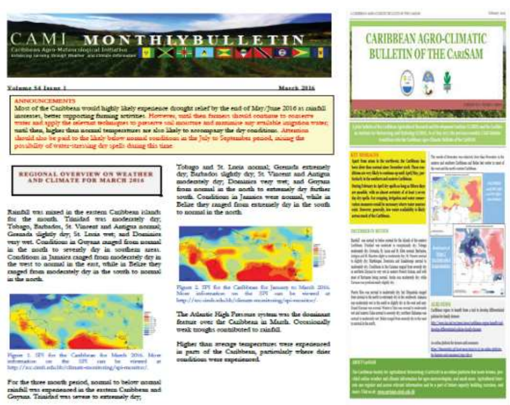
There are clear advantages of approaching this step starting from an evaluation of users' needs and using this information to inform the development of impact forecasting systems. Doing so has identified priority applications such as climate services for *Aedes aegypti* borne diseases such as dengue fever, Chikungunya, Zika and Yellow fever that have historically placed a serious health burden on Caribbean societies (Shepard et al. 2011). The CIMH in partnership with the CARPHA, the Pan American Health Organization (PAHO), national Ministries of Health, NMHSs and an international, inter-disciplinary research team is working to co-design and co-develop a climate-driven spatio-temporal modelling framework that provides early warning of the increased risk of *Aedes aegypti* diseases. Preliminary analyses from this work piloted in Barbados and Dominica provide evidence for the role of climate extremes in seasonal and inter-annual variability in *Aedes aegypti* dynamics and dengue transmission and lay the groundwork for developing a climate-driven early warning system for *Aedes aegypti* transmitted viruses in the Caribbean Lowe et al. 2018; Trotman et al. 2018. Efforts are already underway to extend the scope of the research to other Caribbean countries. Over time, the outputs of this modelling framework can be used for operational, evidence-based decision making in the area of vector control.

The CIMH is also partnering with the CTO and the CHTA to develop a tourism-climate spatio-temporal modelling framework that predicts the influence of intra- and extra- regional climate on tourist arrivals to the Caribbean. Over time, the outputs of this modelling framework can be used to inform strategic and operational marketing decisions – helping the region to take advantage of revenue opportunities that can arise from unfavourable climate conditions in tourist-generating regions in the US, UK and Europe, or alternatively, to manage risks associated with an adverse climate forecast such as severe drought conditions in the Caribbean (Mahon et al. 2018).

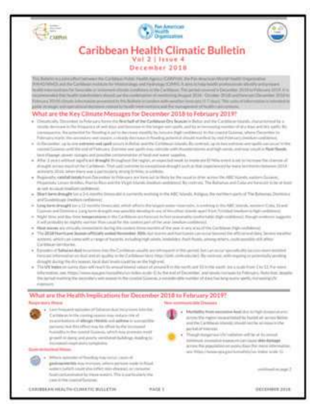
These innovative research-to-operations advances are beginning to address the limited number of sector-specific climate indices for the Caribbean context. In time, these research streams will also seek to correlate past physical and socio-economic impacts associated with past climate conditions in order to better understand the link between climate information and expected impacts and, where possible, provide operational impacts-based forecasts. This enhanced understanding is expected to contribute to a matching of appropriate response strategies to deal with potential impacts. There are future plans to develop decision support tools designed to enable sectoral users to link current climate information to appropriate response strategies (Mahon et al. 2015b). The interface tool and the research that underpin it will bring the region closer to the operationalization of an integrated CSIS that harmonizes climate and sectoral modelling outputs.

STEP 4: CO-DEVELOP, TEST AND VALIDATE CLIMATE PRODUCTS

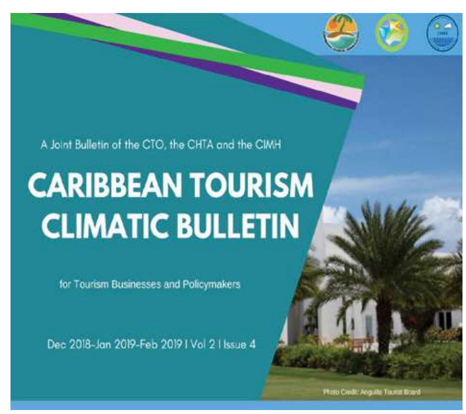
The development of climate-driven sector-specific monitoring and forecasting models and associated full scale information systems will arguably take some time to fully materialize. In the interim, the CIMH and its Consortium partners have harnessed the opportunity to synthesize, tailor and package the key climate messages from CIMH's existing suite of technical climate information products into operational sector-specific climate Bulletins. As the first tangible outputs of the Consortium partnership, the Caribbean Health-Climatic, Caribbean Tourism-Climatic and the revamped Caribbean Agro-Climatic Bulletins communicate sectoral risks and opportunities associated with recent past and upcoming climate conditions for up to 3 to 6 months in advance (Figure 8.4).



Regional CAMI Bulletin (since 2011), now the Caribbean Agro-Climatic Bulletin (since 2017)



Caribbean Health-Climatic Bulletin (since 2017)



Caribbean Tourism-Climatic Bulletin (since 2017)

Figure 8.4: Co-developed sector-specific climate Bulletins. Source: Mahon et. al (2018)

Of significance here was the initial process of co-design involving several rounds of Bulletin prototype testing and validation with hundreds of sectoral practitioners. Today, *operational co-development* is practiced through the co-authorship of each Bulletin issue between CIMH and the regional sector leads for agriculture, health and tourism. Leveraging the knowledge and background of regional sectoral experts in their relevant fields makes it possible to tailor the language of generic climate information for easier sectoral uptake and response. For example, assessment of the risk posed by recent and future climate conditions are contextualized and communicated using language that is salient and understandable for sectoral stakeholders with recommendations for response expressed as customized advisories. Given the differentiated ability across end-user communities to interpret climate information, each sector-specific climate bulletin is communicated with its own nuance and is *co-delivered* online through the Caribbean RCC and Consortium partner platforms.

STEP 5: INTEGRATE PRODUCTS WITHIN SECTORAL DECISION SUPPORT SYSTEMS

Ultimately, both existing and planned climate products, will need to be integrated into sectoral decision support systems such as the CARPHA's CARISURV health surveillance system, and the CTO's Tourism Information Management System. Alternatively, CIMH and its Consortium partners may invest in upgrading the CIMH hosted Caribbean Dewetra platform - a real-time, integrated risk-based data fusion and decision support platform for weather, climate and hydrological information – to serve as a 'one-stop' integrated Caribbean CSIS. At the regional sectoral level, the CDEMA Coordinating Unit already views the Caribbean Dewetra platform as the operational platform to be utilized going forward within its 18 Participating States. Improvements required relate to the expansion of the Platform into the other five climate sensitive sectors, the integration of sectoral DSSs with the Dewetra platform, as well as, the expansion of the Caribbean Dewetra Platform application to the broader Caribbean Region (Mahon et al. 2015b).

STEP 6: STRENGTHEN CAPACITY TO PROVIDE, ABSORB AND UTILIZE CLIMATE INFORMATION

The CIMH, along with its donor partners, continues to invest in a programme of training and capacity building both at the regional level and within CMO Member States for NMHS providers and sectoral users. Since 2012, the CIMH has convened the Caribbean Climate Outlook Forum. At the CariCOF, meteorologists and climatologists from NMHSs receive seasonal forecasting and analytical training prior to a Forum. At the Forum, sectoral practitioners and these meteorologists and climatologists discuss early warning information including seasonal climate forecasts, other experimental products, and share experiences (Mahon et al. 2019; Gerlak et al. 2018). In addition, a series of technical thematic capacity building workshops have been convened to strengthen national and sectoral capacity to access, interpret and use climate information and transform users into 'climate smart' professionals. These include the bi-annual CariCOF, national sectoral EWISACTs Workshops, drought management workshops, as well as, national level climate information downscaling workshops. These interactive forums facilitate provider and end-user interaction and technical capacity building and have no doubt contributed to increasing the capacity of Caribbean practitioners to make climate-informed decisions. However, going forward, the support of all agencies within the Consortium, their affiliate members, international development partners and donors will be required.

8.3. TAILORED CLIMATE SERVICES AT THE NATIONAL LEVEL

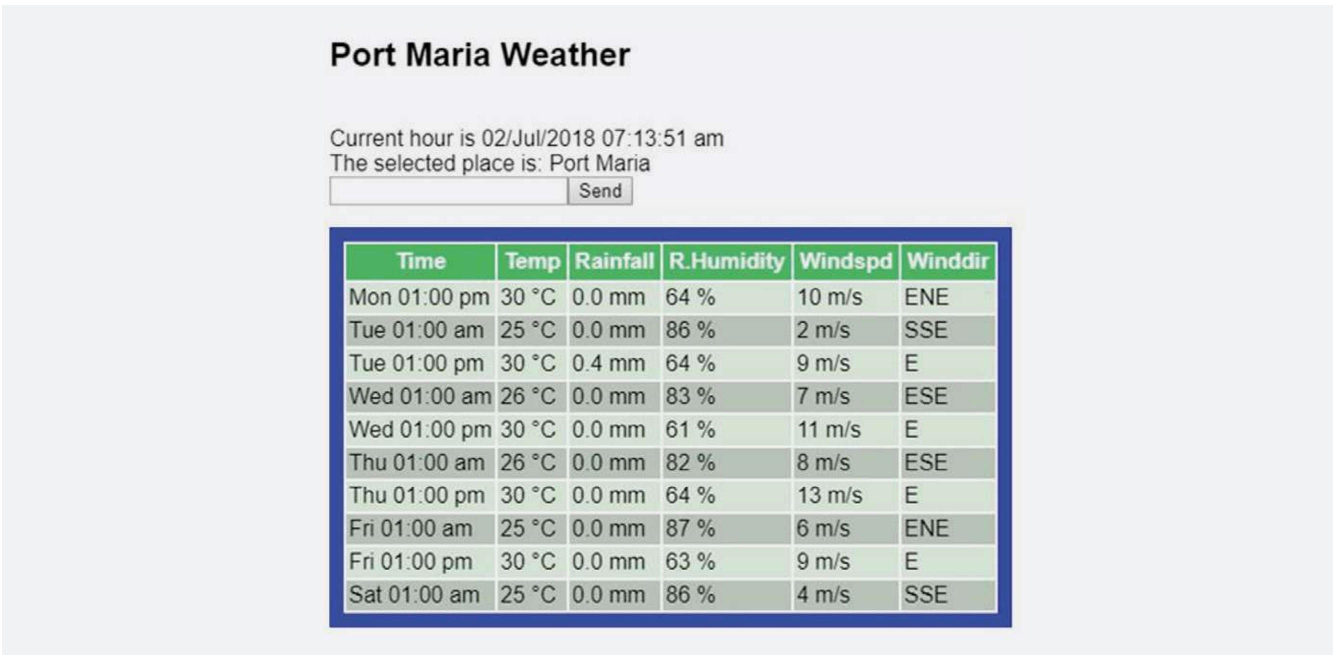
Climate services have been developed at the national level within some Caribbean islands. Jamaica and Trinidad and Tobago provide good examples of the tailoring process.

8.3.1. JAMAICA

In 2009, the European Commission sponsored the Caribbean Agro-Meteorological Initiative (CAMI) through its

Science and Technology Programme for Member States of the African, Caribbean and Pacific (ACP) Group of Countries. The objective of CAMI was to increase and sustain agricultural productivity at the farm level in the Caribbean region through improved applications of weather and climate information using an integrated and coordinated approach in ten countries, including Jamaica. One of the CAMI activities was the delivery of farmers' forums across the pilot States where NMHSs interface with agriculture extension officers and farmers to discuss climate-related issues important for on-farm operations. This series of forums - a compelling example of a sector-specific UIP - led to the formalization of a partnership between the Meteorological Service of Jamaica (MSJ) and the Rural Agriculture Development Agency (RADA) of Jamaica through an MOU that remains in force and active up to today.

The first meaningful outcome was the MSJ responding to a request from farmers during the 2011 forums to provide higher resolution, district-specific weather forecasts (Figure 8.5) and other information (Figure 8.6) which the MSJ subsequently delivered on its web portal (http://agrilinksja.com).


Port Maria Weather

Current hour is 02/Jul/2018 07:13:51 am
The selected place is: Port Maria
Send

Time	Temp	Rainfall	R.Humidity	Windspd	Winddir
Mon 01:00 pm	30 °C	0.0 mm	64 %	10 m/s	ENE
Tue 01:00 am	25 °C	0.0 mm	86 %	2 m/s	SSE
Tue 01:00 pm	30 °C	0.4 mm	64 %	9 m/s	E
Wed 01:00 am	26 °C	0.0 mm	83 %	7 m/s	ESE
Wed 01:00 pm	30 °C	0.0 mm	61 %	11 m/s	E
Thu 01:00 am	26 °C	0.0 mm	82 %	8 m/s	ESE
Thu 01:00 pm	30 °C	0.0 mm	64 %	13 m/s	E
Fri 01:00 am	25 °C	0.0 mm	87 %	6 m/s	ENE
Fri 01:00 pm	30 °C	0.0 mm	63 %	9 m/s	E
Sat 01:00 am	25 °C	0.0 mm	86 %	4 m/s	SSE

Figure 8.5. Weather forecast information for Port Maria in Northern Jamaica

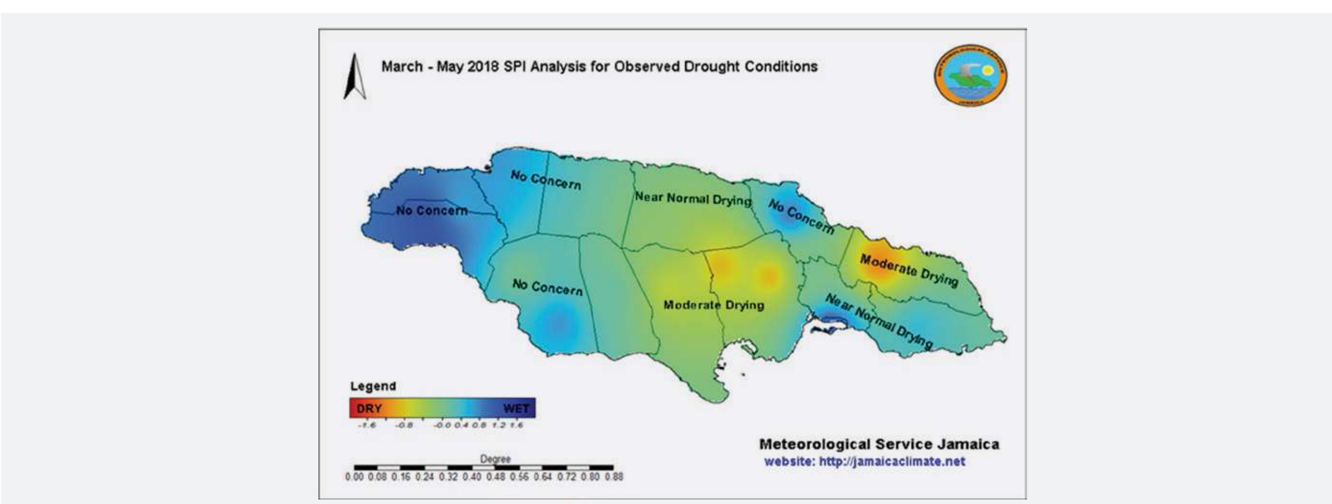


Figure 8.6. Observed drought severity in Jamaica from March to May 2018 using the Standardised Precipitation Index (SPI)

These products have all been made available on the purpose-built Jamaica Climate website which is specifically aimed at "Enhancing Farming through Weather and Climate Information" (www.jamaicaclimate.net). The MSJ and RADA continue to work together to enhance the national observational network, in an arrangement where the MSJ recommends and installs new instruments procured by RADA.

Importantly, the capacity of the MSJ continues to be built through CIMH's traditional, routine training programmes. Specific climate services delivery capacity is routinely upgraded through the CariCOF's training for meteorologists, and other climate related workshops and seminars, including those that are sector-specific in nature. Climate services support has also been provided by the Climate Studies Group Mona, University of the West Indies related to climate change information and projections.

8.3.2. TRINIDAD AND TOBAGO

The Trinidad & Tobago Meteorological Service (TTMS) has actively delivered national weather and climate services since the early 1960s. By the 1980s, in addition to providing generic weather forecasts, monthly climate summaries and dry and wet seasons rainfall forecasts, the TTMS produced customized agro-meteorological forecasts for local farmers and monthly rainfall forecasts for water resources management. Although the TTMS ceased providing daily agriculture forecasts during the 1990s, by May 2013, through the Caribbean climate services programme that coincided with a programme to upgrade the human resource capacity in applied meteorology at the TTMS, there was a relaunch of services for the agriculture sector in the form of dekadal (10-day) agro-meteorological forecasts (Figure 8.7) and bulletins. More recently, the TTMS has collaborated with the Telecommunications Company of Trinidad and Tobago on SMS delivery of its daily weather forecast to farmers' and fisher-folk's mobile phones.

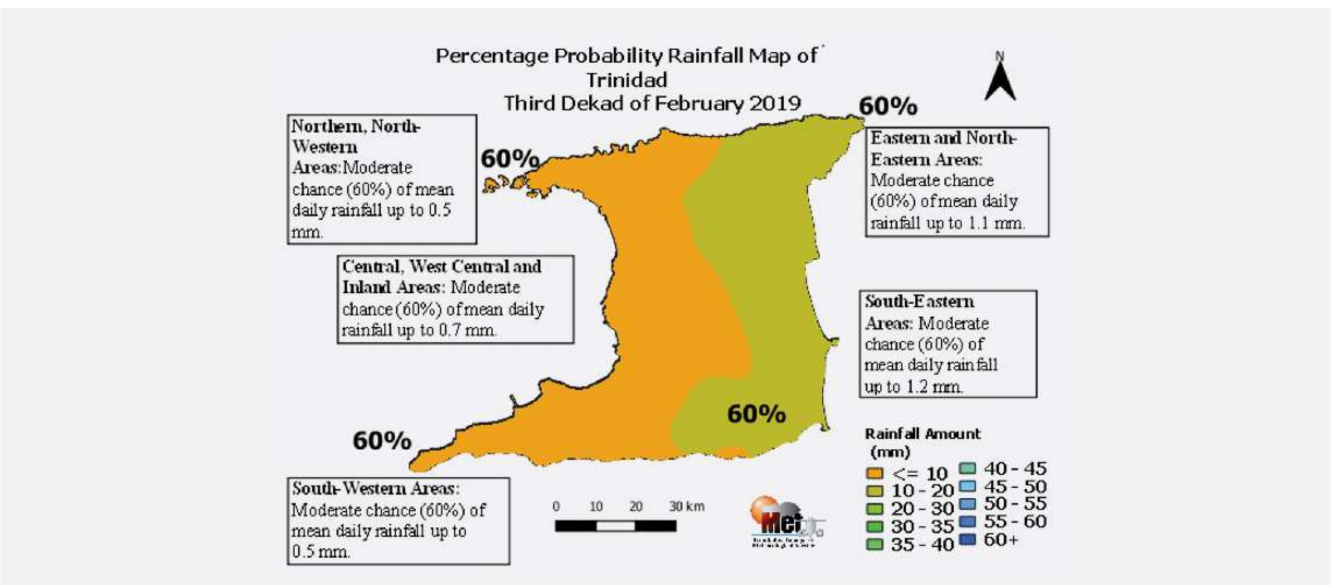


Figure 8.7. Colour-coded ten-day rainfall forecast for various farming districts with percentage probability of occurring.Text boxes show expected regional average daily rainfall totals.

Apart from these, the TTMS has performed climate analysis and monitoring of climate extremes and delivered authoritative climate information and products at the national level. The TTMS delivers a suite of national seasonal climate outlook products on a range of conditions related to rainfall and temperature for the wet and dry seasons. Within each season, three-month climate monitoring and forecast products for rainfall (Figure 8.8), temperature, and dry spells/drought are delivered and updated monthly along with a bi-monthly El Nino-Southern Oscillation Watch. These products are provided directly to key stakeholders within the energy, agriculture and food security, health, disaster risk management, health, water, tourism and financial sectors via emails. Apart from these, the TTMS implemented a health-climate services tab where it provides dengue early warning information based strictly on climate signals for the country. In particular, the early warning is provided for the county with the highest dengue risk potential in the country. Heat and human health products provided include hot spell alerts/warnings/watches when set percentile thresholds are forecasted or met; as well as current observed feels-like (temperature) index and UV index data.

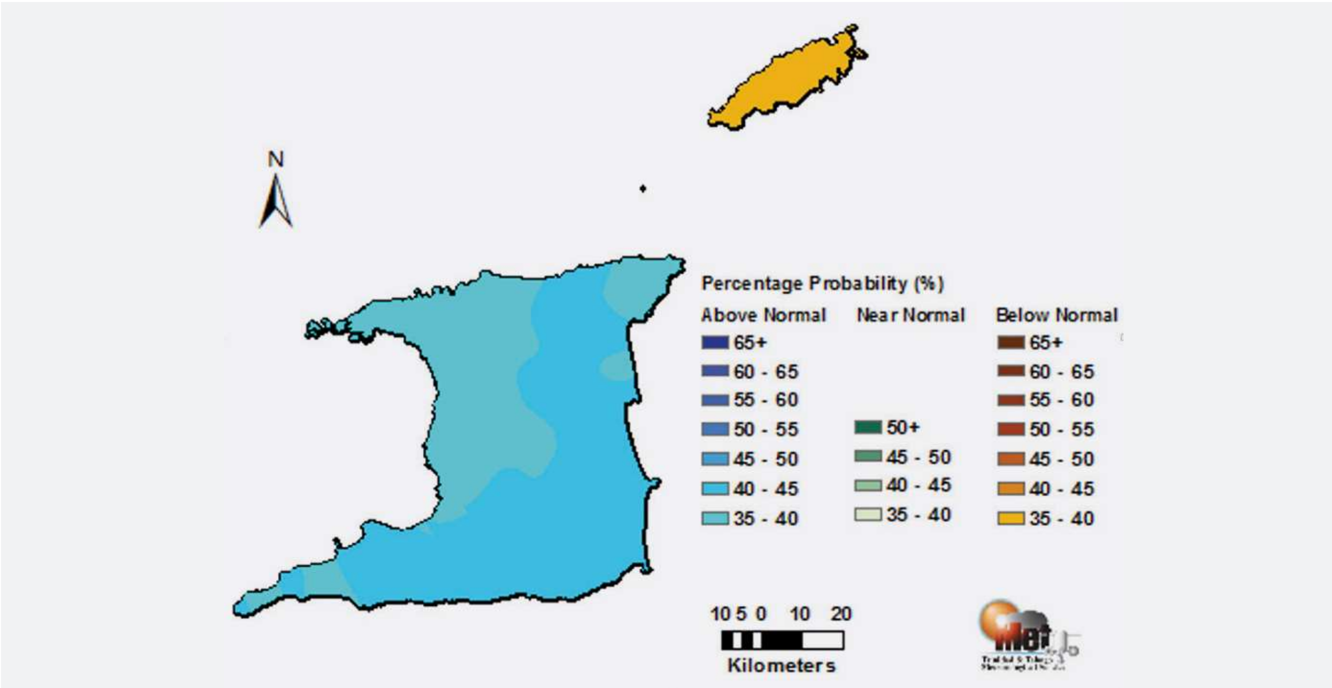


Figure 8.8. Probabilistic seasonal 3-month rainfall outlook presented as the most likely tercile category for the season, colour coded on the map.

The TTMS has been providing specific climate services for water resource management in the form of reservoir site-specific rainfall totals outlooks that are critical for the assessment of reservoir projections, water supply and water availability, as well as risks arising from floods and droughts. These services which contribute to the sustainable management of water resources are made available online (https://www.metoffice.gov.tt/ or the TTMS's weather app) and emailed to key stakeholders.

Additionally, seven National Climate Outlook Forums (NCOFs) – the national flagship UIP - have been hosted under various themes targeting the GFCS priority sectors. Focus areas have included agriculture, disaster risk reduction, rural adaptation, health and disaster risk management. The NCOFs align with the TTMS' thrust to engage stakeholders at the policy, decision-making and planning levels with government ministries, departments and agencies, to share and assist with climate science knowledge, risk management skills and early warning system expertise in support of government's policy development and implementation. The TTMS also supports capacity building across key stakeholder agencies, and provides advice to the Economic Management Division of the Ministry of Finance regarding risk transfer.

The TTMS recently developed and implemented an adverse weather and climate early warning system based on the concept of impact-based warnings and forecasting. It is fashioned after the Common Alerting Protocol international standards that support disaster preparedness, prevention and response for the disaster risk management sector and the public at large. The much needed tool took into consideration, understanding of stakeholder requirements in the key sectors, such as disaster risk management, fishing, agriculture, water, health, oil and gas, and the public, and has shifted focus towards impact factors tailored towards communities. This service now enables the TTMS to issue colour-coded severe weather warnings to various government ministries and authorities including the disaster management units and reaches the widest possible audience. It is preventative in nature as it is expected to prompt advanced action and proactive adaptation to reduce hydro-meteorological hazard-associated risks and costs (i.e. loss of human life, economic costs).

8.4. ADVANCING CARIBBEAN CLIMATE SERVICES IN THE FUTURE

A key lesson emerging from the Caribbean's cumulative experience with the development and use of climate services to date is that considerable investment is still needed to:

1. Strengthen the institutional context for climate services at regional, national and sectoral levels,
2. Enhance and harmonize NMHS and sectoral information production systems,
3. Increase the generation of sector-specific climate information products, and
4. Build the capacity of sectoral practitioners to use these products to make evidence-based, climate-informed decisions.

8.4.1. THE SECTORAL EWISACTS ROADMAP AND PLAN OF ACTION

In an effort to address these gaps and guided by the GFCS philosophy, the Caribbean has established its own consensus-based, regionally tailored framework for climate services - the Sectoral EWISACTs Roadmap and Plan of Action (PoA) 2020-2030. The Roadmap and PoA articulates the main components of the Consortium's proposed cross-agency portfolio of climate service initiatives in the long-term. In this way, it serves as a guide for the implementation of a coordinated, multi-sectoral climate services portfolio.

8.4.2. EXTENDING THE CLIMATE SERVICES PARTNERSHIP

Within the framework of the Sectoral EWISACTs Roadmap and PoA, extending operational climate services beyond the sectors currently being supported is seen as key. It is expected that, in the near future, operational climate services will be integrated implicitly and explicitly in the financial, construction and insurance sectors, among others. Interventions in the new sectors will require discussions and stakeholder mapping strategies to define the areas and styles of intervention.

8.4.3. DOWNSCALING AND COORDINATION OF CLIMATE SERVICES AT THE NATIONAL LEVEL

Recognizing that capacity levels for national coordination of the delivery of climate services are largely embryonic throughout CMO Member States, an area of increased investment going forward is strengthening national level infrastructure, processes and mechanisms for downscaling and coordination of climate services. This will entail supporting Caribbean NMHSs to identify critical gaps and opportunities for inter-sectoral linkages and synergies at the national level; and using this as the basis for inter-sectoral collaboration on the co-design, co-development and co-delivery of tailored national climate products and services in their climate-sensitive sectors.