



Environment and
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SUMMARY REPORT

Status of Provider and End-User Climate Capacity in Caribbean Small Island Developing States

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INTRODUCTION

Given the potential for the production and use of climate information to inform often complex decision-making across a wide range of climate-sensitive sectors thus reducing their vulnerability to climate impacts, in 2009, delegates at the World Meteorological Organization (WMO)-led 3rd World Climate Conference formulated the Global Framework for Climate Services (GFCS) to strengthen and coordinate existing initiatives, and to develop new infrastructure to meet the need for more user-driven climate services (Vaughan and Dessai 2014). The vision of the GFCS is “...to enable society to better manage the risks and opportunities arising from climate variability and change, especially for those who are most vulnerable to climate-related hazards” (WMO, 2011). Global risk indices have consistently assessed Caribbean Small Island Developing States (SIDS) as being at high risk to the impacts of climate-related hazards (Maplecroft, 2014; Eckstein et al., 2018). Climate-sensitive socio-economic sectors that operate within and support the sustainable development of Caribbean SIDS are particularly vulnerable.

The production and transfer of useable climate information by climate service providers and subsequent use of this information by user communities in their decision-making is essential to achieving the GFCS vision in the Caribbean. Producing climate information in a form that can be readily used requires that the needs and capabilities of end-users to incorporate climate information into routine decisions is understood. However, up until 2015, there were insufficient baselines of end-user climate information needs and capacity in the Caribbean to inform product tailoring and development for climate-sensitive sectors. Moreover, knowledge regarding National Meteorological and Hydrological Services (NMHSs) capacity to deliver climate products and services was also not empirically robust. Since the Caribbean was formally at the start of its process of implementing the GFCS, a formal measurement of provider and end-user capacity was needed.

To address this knowledge gap, the CIMH with joint support from the Environment and Climate Change Canada (ECCC) and the World Meteorological Organization’s (WMO) Programme for Implementing the Global Framework for Climate Services (GFCS) at Regional and National Scales Programme and the Programme for Building Regional Climate Capacity in the Caribbean (BRCCC Programme), has conducted research exploring NMHS capacity to deliver climate services in the Caribbean, as well as, end-user needs for climate services in the Caribbean. Key results are summarised in this report.

BACKGROUND

Role of the CIMH and NMHS supporting GFCS Implementation in the Caribbean

The launch of the GFCS in 2009 signaled an increase in expectations and pressure for the NMHSs to expand and adapt their traditional hydro-meteorological portfolio to include climate services, and for NMHSs to broaden their skill set to deliver a fuller range of services and particularly services focusing on producing user-oriented and sector-specific climate information.

Since its inception as the Caribbean Meteorological Institute (CMI) in 1967, the Caribbean Institute for Meteorology and Hydrology (CIMH) has evolved its capability over the last 50 years to serve the climate information needs of the 16 Caribbean Meteorological Organization (CMO) Member States. Beginning in 2012, the CIMH began to routinely generate a range of regional climate information products (see Appendix 1). Moreover, the Caribbean Climate Outlook Forum (CariCOF) stewarded by the CIMH since 2012 is one avenue critical for the development and delivery of climate services that support effective climate early warning systems at regional and national levels. At this bi-annual event, meteorologists and climatologists from Caribbean NMHSs receive forecasting and analytical training and then participate in a Forum in which scientists and sectoral decision-makers discuss the seasonal climate forecasts, other experimental products, and share experiences. Outside of the semi-annual meetings, consensus CariCOF climate outlooks are routinely produced each month by the CIMH in collaboration with participating NMHSs. In these ways, the CIMH as the regional gatekeeper for the Caribbean NMHS community, plays a key role supporting the NMHSs to downscale regional climate information to the national context.

Together, the CIMH and the NMHSs focus on providing services spanning the historical to seasonal timescales, with less emphasis on climate change. In the Caribbean, there are other actors including the Caribbean Community Climate Change Center (CCCCC), the Climate Studies Group at the University of the West Indies Mona (CSGM), and NGOs like the Red Cross which offer research and services on different climate timescales, and most commonly focus on climate change, but with whom CIMH often collaborates on issues related to climate trends and climate change. However, in this report, we focus on the capacity of the CMO/CariCOF network to deliver climate services, as well as end-users within this grouping to use them.

The CMO and CariCOF grouping

Collectively, the CMO and CariCOF grouping is a diverse set of countries and territories that share common characteristics and challenges including small size, insularity, remoteness, ecological fragility and economic vulnerability. There are 31 countries and territories in the CMO and CariCOF grouping - 16 of which are independent countries and the remaining 15 are dependencies of France, the United Kingdom, the Netherlands and the United States. All CMO Member States are part of the CariCOF grouping (Figure 1).

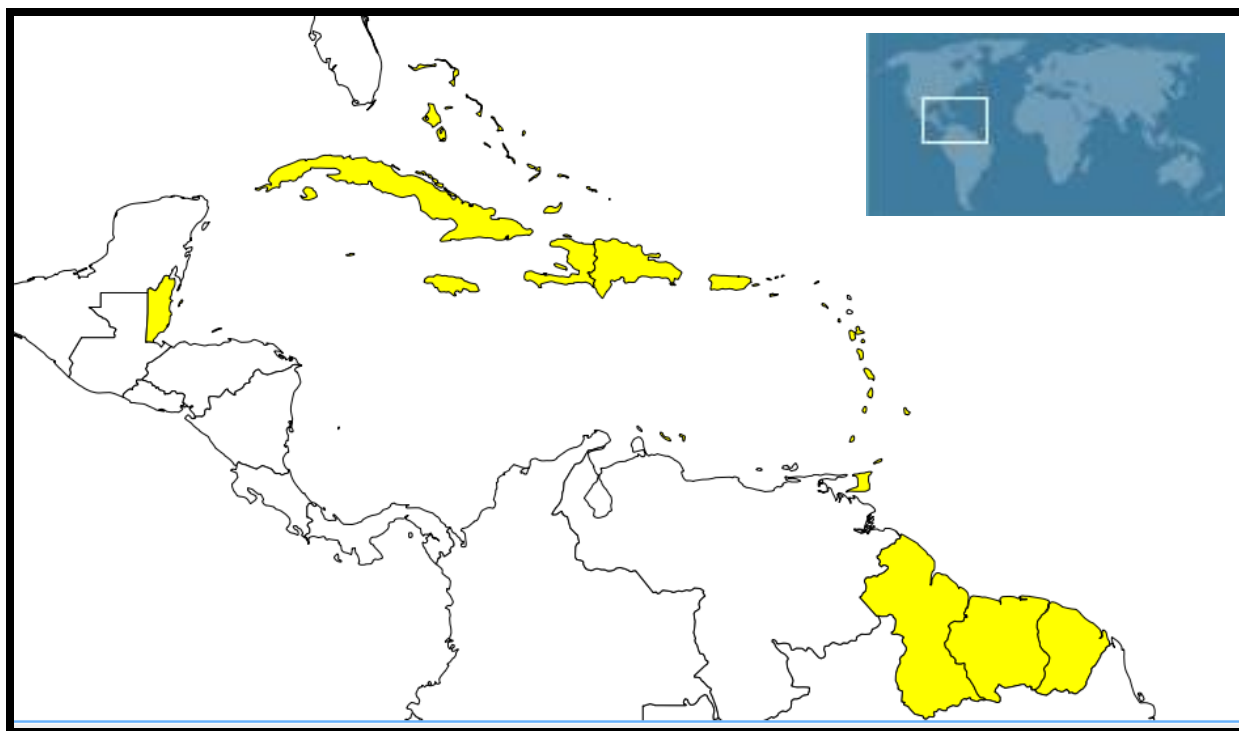


Figure 1. The CariCOF grouping

These countries and territories are profiled in Appendix 2.

METHODS

For the NMHS capacity assessment, a multiple methods approach was employed, using document analysis (May 2015 - April 2017), a regional survey (see Appendix 3 for questionnaire) of key informants from 22 Met services in the CMO and CariCOF grouping (August - December 2015) and 4 semi-structured focus group discussions (FGDs) (see Appendix 4 for FGD protocol; 2 FGDs at the Wet/Hurricane Season CariCOF in May 2016¹ with 18 respondents; 2 FGDs at the Dry Season CariCOF in December 2016² with 22 respondents). The same topics were addressed in the 4 FGDs and mirrored questions in the survey. In terms of the respondent profile, our largest respondent sub-group in the survey (41%) was Directors or senior practitioners of the NMHSs, while FGDs participants were largely the operational personnel directly responsible for the production of climate information products in their respective countries.

For the end-user needs and capacity assessment, a multiple methods approach was also employed, using a regional survey (see Appendix 5 for questionnaire), semi-structured interviews (see Appendix 6 for interview protocol) and FGDs (see Appendix 7 for FGD protocol) targeting stakeholders in the CMO and CariCOF grouping. The regional survey was administered

¹ Convened in Dominica.

² Convened in Grenada.

at 4 CariCOF assemblies³, 5 In-country Capacity Mapping Workshops⁴ and 3 Drought Management Writeshops⁵ between June 2015-December 2016. Responses were received from 194 stakeholders in the agriculture, water, disaster risk management, health, tourism, energy and other sectors in 19 countries. In addition, 37 semi-structured stakeholder interviews were conducted between May 2016-February 2017, while 23 stakeholders participated in 3 FGDs convened at the Wet/Hurricane Season CariCOF in May 2016.

At the time of the research, there was not yet a comprehensive inventory of national level climate information available. The suite of climate information tools and products available at the regional level included the Caribbean SPI Monitor and Outlook, the CariCOF Precipitation Outlook, the CariCOF Temperature Outlook, the CariCOF Drought Outlook, the Caribbean Coral Reef Watch, the Wet Days Outlook, the Wet Spells Outlook, the Caribbean Drought Bulletin, the CariCOF Climate Outlook Newsletter, the Caribbean Agro-meteorological Initiative (CAMI) Bulletin, the Caribbean Dewetra platform and the Caribbean Climate Impacts Database. The questions asked, as well as, the results presented in this report reflect this. Since that time, there have been several generic climate, as well as, sector-specific additions to the product suite including the CariCOF Dry Spells Outlook (Experimental), the CariCOF Heat Outlook (Experimental), the Caribbean Health-Climatic Bulletin and the Caribbean Tourism-Climatic Bulletin. The profile and content of the CAMI Bulletin has also been significantly enhanced in the form of the Caribbean Agro-Climatic Bulletin of the Caribbean Society for Agro-Meteorology (CariSAM).

SAMPLE PROFILES

National Meteorological and Hydrological Services

NMHSs from 22 countries⁶ participated in the survey. Most NMHSs (72%) have been in operation as members of the WMO for more than 50 years, with less mature services being in operation for a range of 28 - 36 years. By contrast, NMHSs have been delivering climate services for a much shorter period of time with 45% of the sample reporting that they have been delivering climate services for 10 years or less and 50% for more than 10 years.

³ Convened in Saint Lucia in June 2015, St. Kitts and Nevis in November 2015, Dominica in May 2016 and Grenada in December 2016.

⁴ Convened in Barbados in November 2015, Trinidad and Tobago In February 2016, Dominica in March 2016, Belize in June 2016 and Jamaica in December 2016.

⁵ Convened in Saint Lucia in January 2016, Antigua and Barbuda in February 2016 and St. Kitts and Nevis in March 2016.

⁶ Anguilla, Aruba, Antigua & Barbuda, Barbados, Belize, British Virgin Islands, Cayman Islands, Cuba, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Montserrat, Puerto Rico, St. Kitts and Nevis, Saint Lucia, St. Maarten, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago.

Although there is variation in which sectors are served and to what extent, collectively, Caribbean NMHSs serve a range of climate-sensitive sectors including the agriculture, water, disaster risk management tourism, health and energy sectors, among others (such as the marine and finance sectors).

With regards to legal status and situation in government, we found that the legal basis of operation of NMHSs in the Caribbean and their location in government vary widely across countries. NMHSs generally do not have legal status as many were not established under a specific legal instrument. Where there is a legal instrument guiding NMHS operations, this is likely narrow in terms of Civil Aviation, thus impacting the type and scope of services offered. Moreover, national laws, decrees or other legislative acts on *meteorology* or *climatology* do not exist.

While all 22 NMHSs are responsible for their nation's meteorological services, 5 countries do not have formal mandates for climatology.

Most NMHSs operate as meteorological departments within government ministries. While there is a heterogeneous mix of ministerial portfolio locations under which Met Services fall, the most common portfolios were Civil Aviation, Agriculture and Ports.

The majority of NMHSs (73%) report that the main source of funding is the government. NMHSs that utilise cost recovery options from commercial activities such as the provision of aviation services is comparatively small (12-21%). Some NMHSs report that alternative finances are sourced from projects funded by international agencies. Budget expenditure per capita ranges from a low of US\$1.63 to a high of US\$8.23 (2013 year dollars) (World Meteorological Organization n.d).

The number of technical staff of the NMHS varies. Eight (36%) NMHSs have more than 20 technical staff. Not surprisingly, these correspond to some of the larger countries. The majority, however, have fewer than 20 technical staff.

End-users

The majority (75%) of the 194 survey respondents operate at the national level in 19 countries⁷. Most respondents in the survey sample were from the agriculture (31%), water (18%) and DRM (17%) sectors while representation from the health (8%), energy (6%) and tourism (5%) sectors was low. Most respondents (79%) are attached to a Government agency; 35% occupy strategic leadership positions in these agencies while 45% are involved at the operational level as technical experts/officers and approximately 7% are involved in research.

⁷ Anguilla, Antigua and Barbuda, The Bahamas, Barbados, Belize, British Virgin Islands, Cayman Islands, Cuba, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, Trinidad and Tobago and the Turks and Caicos Islands.

FGD participants were largely stakeholders at the operational level in 12 countries⁸ while interview respondents were operational stakeholders in 13 countries⁹. The 23 FGD participants were mainly from the health (39%) and DRM (26%) sectors, while representation from the agriculture (9%), water (4%) and tourism (4%) sectors was comparatively low. The energy sector was not represented among the FGD sub-grouping. The majority of the 37 interview respondents were from the tourism (46%), agriculture (22%) and water (19%) sectors, while representation from the DRM (5%), energy (5%) and health (3%) sectors was low.

CAPACITY OF CARIBBEAN NMHS TO DELIVER CLIMATE SERVICES

Climate Service Capability on WMO Hierarchical Scale

The WMO categorises the functional capabilities of national climate service providers on a hierarchical scale of 1 to 4 in which capacity increases with each incremental category (Figure 2).

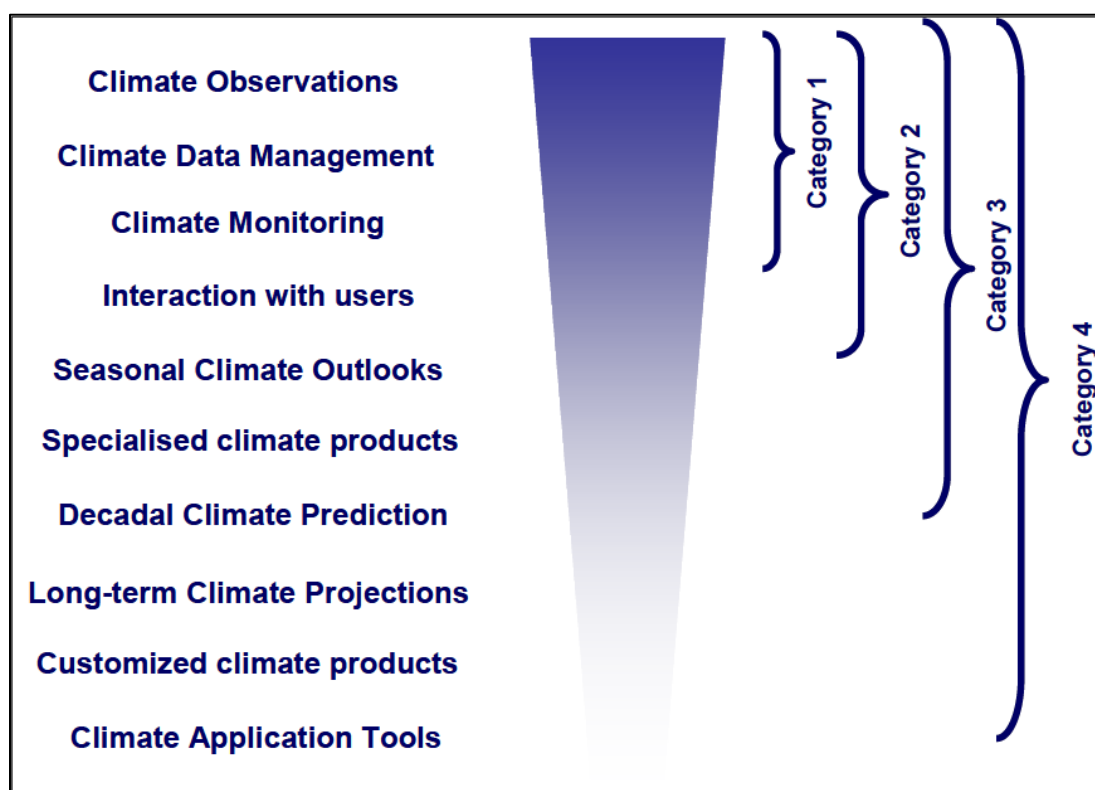


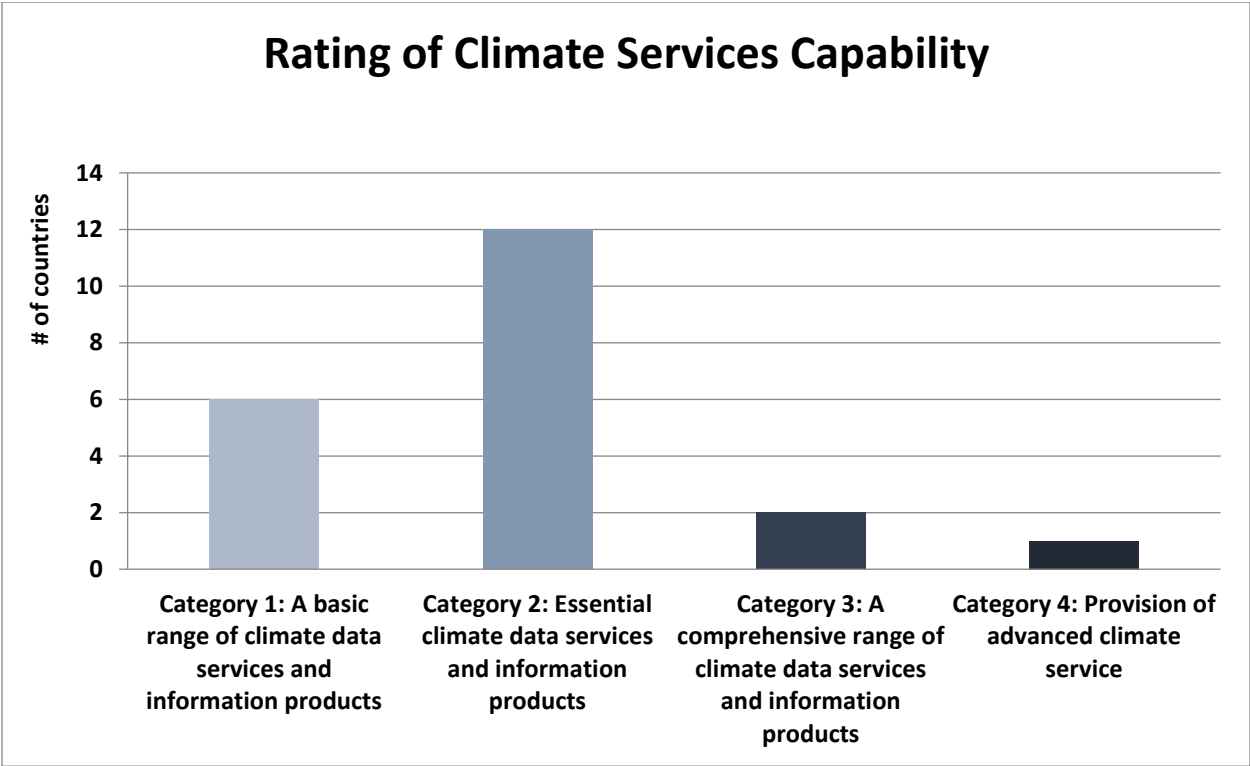
Figure 2. Hierarchy of National Climate Services. Source: WMO (2012)

⁸ Antigua and Barbuda, Barbados, Belize, Cuba, Grenada, Jamaica, Saint Lucia, St. Kitts and Nevis, St. Martin, St. Vincent and the Grenadines, Suriname and Trinidad and Tobago.

⁹ Anguilla, Antigua and Barbuda, The Bahamas, Barbados, Belize, Cayman Islands, Dominica, Grenada, Guyana, Jamaica, Saint Lucia, St. Vincent and the Grenadines and Trinidad and Tobago.

Category 1 corresponds to the ability to deliver a basic range of climate data and products, to participate in regional climate forums, and to engage in limited interactions with end-users. Category 2 corresponds to the ability to deliver a basic range of climate services and products, as well as, to provide climate predictions. Category 2 organisations also participate in climate forums, interact with end-users from different sectors, and gather feedback on the information that end-users provide. Category 3 corresponds to the ability to be able to provide a comprehensive range of climate data services and information, such as specialised climate products for major sectors and downscaled long-term climate projections. Finally, Category 4 organisations have the capacity to cover activities in all other categories. In addition, organisations in Category 4 possess the ability to conduct research, run Global and Regional Climate Models, and serve as an RCC or part thereof.

Our results (Figure 3) show that there are six countries identified in the lowest Category 1; twelve countries consider themselves to be at the Category 2 level; two countries self-identified as Category 3; while only 1 country self-identified as Category 4. One territory did not answer this question.



Category 1= Anguilla, Aruba, Grenada, Haiti, Montserrat and St. Maarten
Category 2= Antigua and Barbuda, Barbados, Belize, Cayman Islands, Cuba, Dominica, Guyana, Jamaica, Saint Lucia, St. Vincent and the Grenadines and Suriname, St. Kitts
Category 3= Trinidad and Tobago and the Dominican Republic
Category 4= Puerto Rico

Figure 3. NMHS self-rating of national climate service capabilities

Climate Information available at the National Level

We further found that while all NMHSs produce some form of climate product and/or service, there is substantial diversity in the number and type of information and services offered (Figure 4).

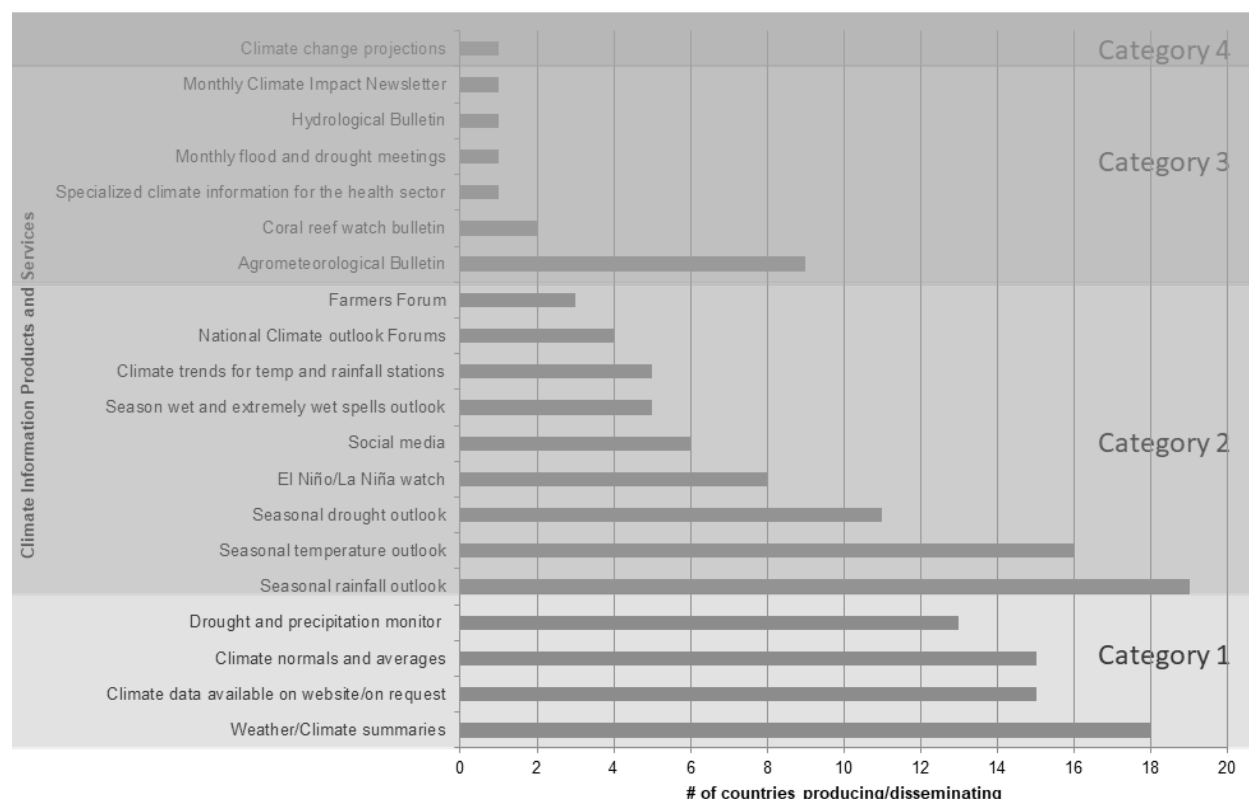


Figure 4. Climate information products and services across countries

Since the large majority of Met Services (17 countries) fall into Category 1 and Category 2 service provision, the products produced at the national level reflects this dynamic. Most NMHSs are engaged in summarising and providing climate data, providing climate monitoring information, as well as, seasonal climate forecasts, while very few are engaged in producing specialised products for major sectors.

The range of generic climate information produced at the national level can be used to some extent by the major climate-sensitive sectors that NMHSs serve in the Caribbean, namely the agriculture, water, DRM, health, energy and tourism sectors. Figure 5 makes clear that specialised products that target the agriculture sector dominate the national climate product portfolio with this sector currently benefitting from a tailored product in 9 countries (Antigua and Barbuda, Belize, Dominica, the Dominican Republic, Grenada, Guyana, Saint Lucia, St. Vincent and the Grenadines and Trinidad and Tobago). Only a minority of NMHSs are producing products tailored specifically to sectors other than agriculture. The Dominican Republic for

example, produces a hydro-meteorological bulletin for the water resources sector, while only Cuba offers specialised climate information services for the health sector.

Capacity to deliver across the GFCS Pillars

As a framework, the GFCS is built upon five pillars (World Meteorological Organization, 2014: v), namely:

1. *Observations and Monitoring* (Obs and Mon) ensures that climate observations, other data and metadata necessary to meet the needs of end-users are collected, managed and disseminated;
2. *Research, Modelling and Prediction* (RMP) fosters research that improves the scientific quality of climate information and provides an evidence base for the impacts of climate variability and change, as well as, the cost-effectiveness of using climate information;
3. *Climate Services Information System* (CSIS) is the mechanism through which information about climate (past, present and future) is routinely collected, stored and processed to generate climate products and services;
4. *User Interface Platform* (UIP) refers to a structured means for end-users, climate researchers and climate information providers to interact at all levels;
5. *Capacity Development* (CD) is all encompassing in addressing capacity development requirements identified under Pillars 1-4 and, more broadly, in addressing the basic requirements for enabling any GFCS-related activities to occur.

When capacity is examined across the 5 GFCS pillars (Figure 5), the results indicate that NMHSs in the region perceive themselves to be the most capable to perform Pillar 1 activities (particularly climate observations, climate data management and climate monitoring). Capacity in these areas were self-assessed as being at high or moderate levels. However, capacity to perform in areas generally associated with activities on Pillars 2-4 are deemed to be much lower (specifically activities related to RMP, the CSIS and the UIP).

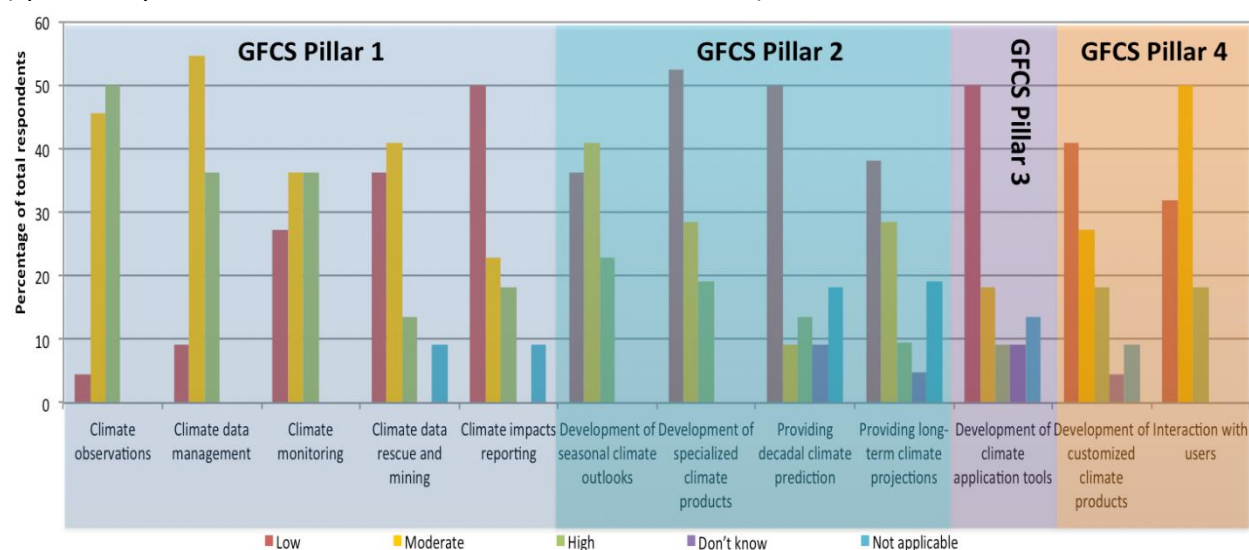


Figure 5. Perceived capacity across GFCS Pillars

Capacity Gaps across the GFCS Pillars

Observations and Monitoring Gaps

The survey, interviews and FGDs identified data gaps across three major types of observational input data - 1) climate time-series data, 2) climate impacts data, and 3) sectoral time-series data - that are critical to the production of both generic and sector-specific climate information products.

In terms of climate time-series data, quality controlled observations have not been collected with sufficient time in some countries to enable the development of 30-year climatological records. We know of two countries for example, where records did not begin until about the late 1980s. Only 3 countries report that climate data rescue and mining capacity is high. Additionally, some countries have yet to completely digitise their historical data. Reported failures to equipment and inconsistent maintenance further limit complete records. Moreover, 13 NMHSs reported that their organisation is not collecting the full spectrum of observational data (e.g. sunshine duration, incoming solar radiation) they deem important for developing tailored climate information products, while 17 NMHSs reported a lack of finer resolution data as a major barrier to providing climate services. Twenty NMHSs report that their climate database management capability is moderate to high. However, there are some NMHSs that still rely on Excel spreadsheets to share and analyse climate data.

With regards to climate impacts data, less than half the NMHSs collect data on climate impacts and when the data is collected, it seems to be championed by the adhoc individual motivation of a NMHS representative rather than being an operational activity. This ultimately affects the ability to engage in climate impacts modelling.

Finally, the lack of sectoral time-series datasets was also highlighted. Sectoral time-series are key inputs for the development of user-oriented climate information products. However, in many cases, the historical data on essential sectoral variables that are key to end-users' work may not exist (e.g. evapotranspiration, soil moisture infiltration or run-off rates). In other instances, sectoral data may exist, but may be in analog form and in need of digitising. Moreover, there may also be poor inter-sectoral collaboration due to territorial wars. For example, in one country the Water sector reported that the Met Service may not always provide information when they need it.

Research, Modelling and Prediction Gaps

With regards to research, modelling and prediction, there is generally embryonic research capabilities and processes at the national level. For example, only 4 NMHSs have a research division while only 2 NMHSs have a long-term research strategy. In particular, there appears to be very limited support to conduct the type of problem-driven, inter-disciplinary research that is required to develop specialised products tailored to sectoral end-users. Only 1 NMHS has funding for research in sector and climate applications; while 5 NMHSs have formal

collaboration with an outside research group other than the CIMH. These gaps help us to understand the limited performance of NMHSs when it comes to engaging in applied sector-specific research (Figure 6).

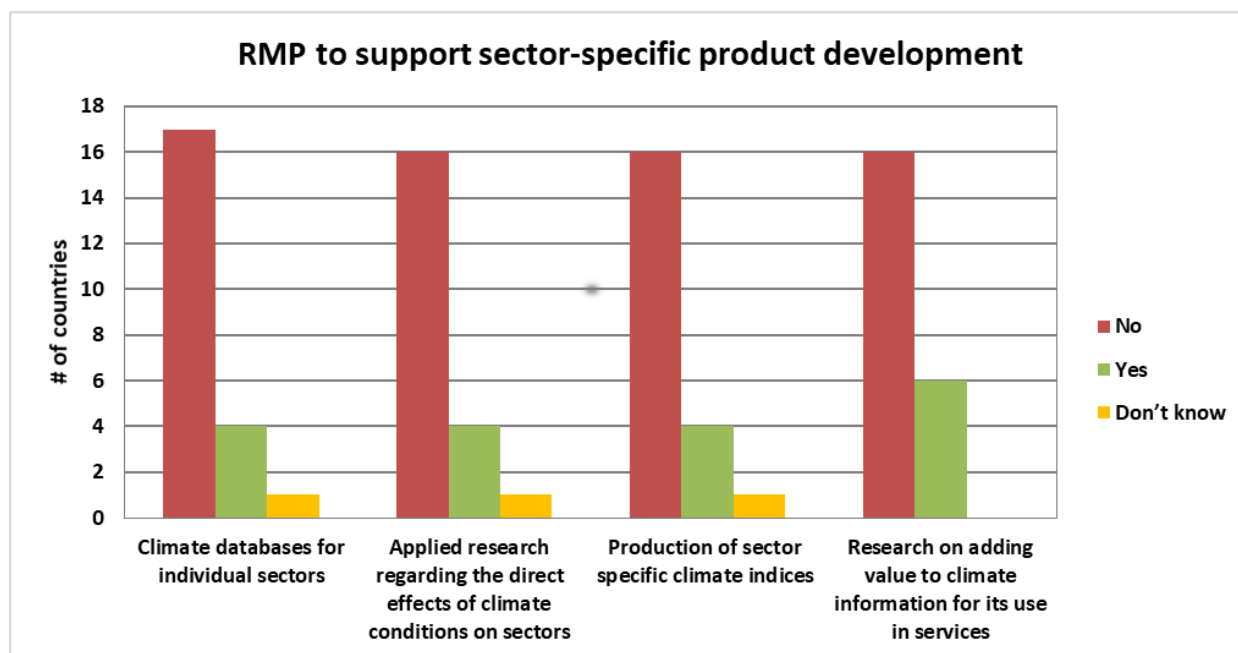


Figure 6. RMP to support sector-specific product development

Climate Services Information System Gaps

With regards to the CSIS, the majority of NMHSs in the sample have not invested in the development of climate application tools.

User Interface Platform Gaps

Capacity gaps on Pillar 4 not only reveal deficiencies in NMHS capacity to interface with end-users, but more broadly it reveals capacity to enable end use of the information produced by the NMHS. It was found that there is variability in the types and level of NMHS interactions with end-users. Importantly, only 4 countries (Trinidad, Guyana, Belize and Suriname) have convened National Climate Outlook Forums - reinforcing the fact that for some NMHSs, formal systematic interaction with a broad base of sectoral end-users is still an embryonic exercise (“... the distance between the Met Office and the stakeholders is too big...”, Aruba NMHS representative; “...the usual is just the agriculture thing, and I guess, the other sectors, a lot of them are not even aware of what products we provide or that are available for them...”, Dominica NMHS representative). For other NMHSs, there are some areas of service that respondents feel that they have mastered, particularly regarding interacting with end-users to: 1) answer basic climatology questions, 2) identify end-users’ climate information needs, and 3) interpret and use climate information (Figure 7).

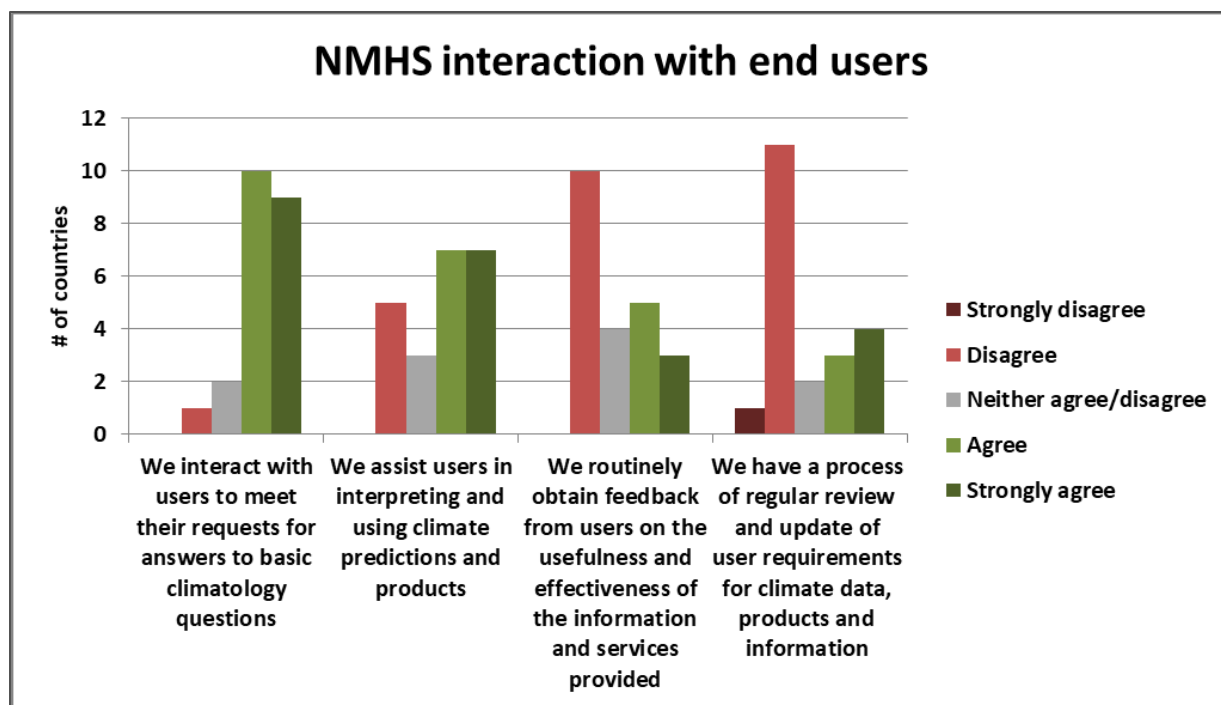


Figure 7. NMHS perception of interaction with end-users

Capacity Development Gaps

The research suggests that NMHSs which have historically focused their service delivery portfolio on meteorology, particularly aviation meteorology, will likely experience knowledge and expertise gaps in their implementation of climate services. In fact, several areas integral to the successful development of climate services at the national level were assessed by survey respondents as priorities for future investment (Figure 8).

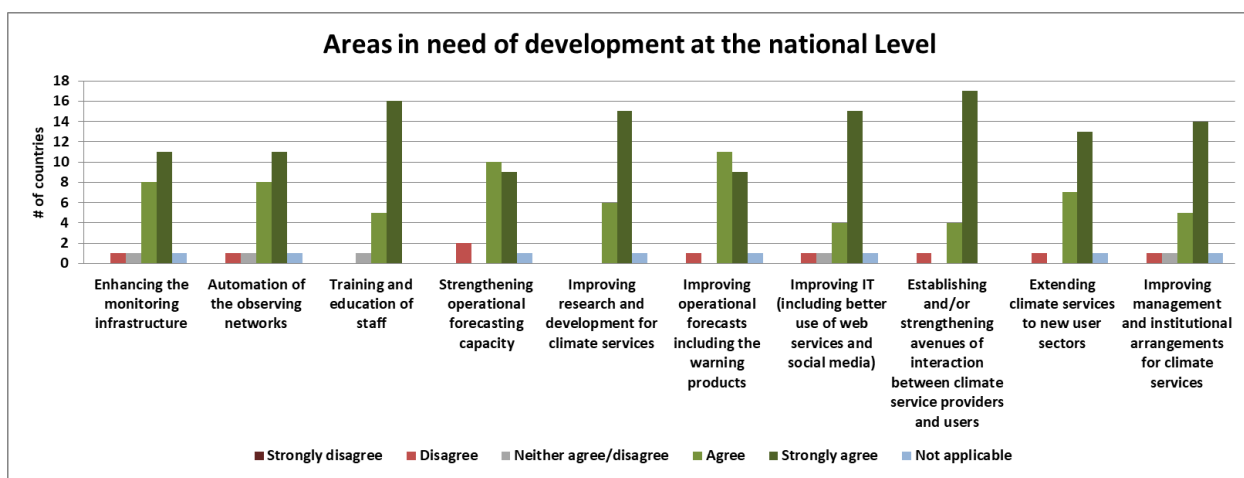


Figure 8. Areas in need of development at the national level

Moreover, the FGDs revealed that in many cases, there is no Climatologist at the degree level on staff and NMHSs are not structured to incentivise staff to focus on this area of specialisation. Gaps in *technical knowledge* (e.g. long-term climate monitoring and prediction; climate impact reporting, risk modelling and assessment); *technical tools* (e.g. long range forecasting and associated tools, GIS mapping software); and *specialised skillsets to interact with end-users* (e.g. risk communication) were areas identified by respondents as key deficiencies.

In addition, we found that with many NMHSs that are institutionally attached to the Airport Authorities, the climate service agenda has a low priority versus other operational deliverables. Several FGD participants raised that Airport Authorities were reluctant to invest in climate services as this was not required in Airport operations. A meteorologist from one such country noted: "...technically, by the letter of the law, we have no national Met Service, so to speak. What exists is that the Airports Authority has a Met department which provides for the airport, and by extension, the country...But by legislation, there is not a national Met Service. So in the absence of that, my management is rather hesitant to go and spend a lot of money to update data, to go and put rain gauges all over the country because that's not their mandate, as passed in law... So the climate services is seen as an additional extra." This quote demonstrates how the legal and institutional status of NMHSs are not only intricately tied together but ultimately affect climate service delivery.

At a more strategic level, gaps and inconsistencies in the political and policy context were apparent. There were indications that political support for climate services was problematic: "...it does not matter how much work we do. If the ministry does not support it, it does not go anywhere..."; while the policy context to support climate services was weak. There was little indication, for example, that national level policies for creating broad access to the range of data types needed for generating sector-specific climate information exist. NMHS representatives also raised the issue of the lack of inter-institutional policies and agreements facilitating data sharing and access. Only a few examples of NMHS collaborating with sector organisations were uncovered. For example, the NMHS in one country brokered an agreement to use the rain gauges of a water management agency, which boosted the spatial coverage of the NMHS monitoring network. Moreover, there were no apparent national level policies that outline how NMHSs should interact with national stakeholders in their new and emerging role as climate service providers.

Enablers to Climate Services Provision

As the research results have shown, there is variability in the capacity of countries and territories on the five GFCS pillars. While many or some components of the framework for the provision of climate services may be in place to varying extents at national levels, the evidence suggests that these components may not be coherently managed nor responsive to user, as well as, NMHS provider needs. To compensate for infrastructural and capacity gaps at the national level, the CIMH coordinates the CariCOF network - a model of regional cooperation involving 27 territories sharing data and conducting research towards improved understanding

of climate predictability in the region and engages in capacity building efforts that improve technical capacities to generate methodologies, tools and products to transform and enhance operational climate services. These capacity building efforts by the Caribbean RCC were acknowledged by NMHS respondents as a critical enabler of national level modelling and prediction efforts:

“...for Antigua, our goal is really to position ourselves to be the national climate service for our country, so we are aiming to sort of mimic much of what CIMH is doing but at a national level. A lot of the products produced by CIMH we try to downscale them further to our local level ... CIMH, as you would know, have fed a lot of the capacity in the national services. Where CIMH is not providing direct support, they are doing so indirectly through capacity building, through interactions... to help us provide better products locally...” (Antigua and Barbuda NMHS representative)

“...for Suriname, we try to tailor our own products. Of course, CIMH has done a lot of capacity building within the Met Service. We are using that kind of knowledge as well, especially for the climate outlook...” (Suriname NMHS representative)

“About 25% of what I present is CIMH.....” (Saint Lucia NMHS representative)

The newly designated Caribbean RCC has invested not only in technical training but also in tools to support the operational RMP collaboration. For example, the Institute hosts and maintains the Caribbean Outlook Generator (CAROGEN) - a regional tool which facilitates the production of regional climate outlooks and provides updated climatological statistics for embedded stations using a dedicated, purpose-built and customised climate database/data management system and associated web portal. This climate research tool plays a pivotal role in supporting RMP activities at the national level:

“ ... the fact we have the CAROGEN, this online generator for all the products. It eases the burden in some areas. We still have things we do locally, but CAROGEN helps a lot....in a nutshell, CAROGEN has reduced the work that we would do from days to minutes.” (Antigua and Barbuda NMHS representative)

“.... instead of having the calculations done in a day, like I now do it in two hours. ... I have to thank CAROGEN for that, because CAROGEN has made it much easier to produce the probabilities, normal and above, and the outlook maps also.” (Barbados NMHS representative)

The CIMH has invested in additional tools such as the Caribbean Climate Impacts Database, an open-source geospatial inventory of geo-referenced, historical climate-related impacts that is intended to support the forecasting and modelling of climate risk over time. This is an explicit attempt to overcome the limitation of insufficient climate impacts reporting at sectoral and national levels.

CAPACITY OF END-USERS TO USE CLIMATE INFORMATION

Barriers to climate information use are important to identify since they ultimately affect end-user uptake and integration of climate information into decision-making. Analysis of interview and FGD data revealed three dominant types of barriers that inhibit climate information use among Caribbean end-users in climate-sensitive sectors:

1. End-user climate literacy gaps
2. The nature and quality of climate information
3. Provider-user relationship gaps

End-user climate literacy gaps

Among sectoral end-users, we found differential levels of awareness of the climate variability timescale, as well as, conceptual clarity regarding the distinctions associated with the weather, climate variability and climate change timescales. Throughout the interviews and FGDs, the majority of sectoral stakeholders were prone to using references to weather and climate interchangeably. Results show that the climate change discourse is dominant in the mindset of respondents, with awareness of the weather timescale subordinate to climate change but also dominant. By contrast, there is very little nuanced awareness of the climate variability timescale. While respondents from the agriculture, water and DRM sectors displayed higher levels of awareness and conceptual clarity, relatively lower levels of awareness and clarity were associated with stakeholders in the tourism and health sectors¹⁰. This is perhaps symptomatic of the fact that until 2015, the large majority of the CIMH's and the CariCOF network's effort had been focused on engaging the agriculture, water and more recently, the DRM sectors. While some work had been done with the health sector, there had been minimal engagement of the tourism and energy sectors.

Awareness of the existence and availability of climate information can be considered as a proxy indicator to the capacity to access and use climate information. However, survey data revealed that a significant number of end-users are unaware of key climate information, tools and products that are routinely available to them (Figure 9) pointing to the need for more work to be done on awareness building as a first step to catalysing end-user access.

¹⁰ Note that due to the small sample size for the energy sector in the interviews and FGDs, not much can be said about the energy sector on this issue.

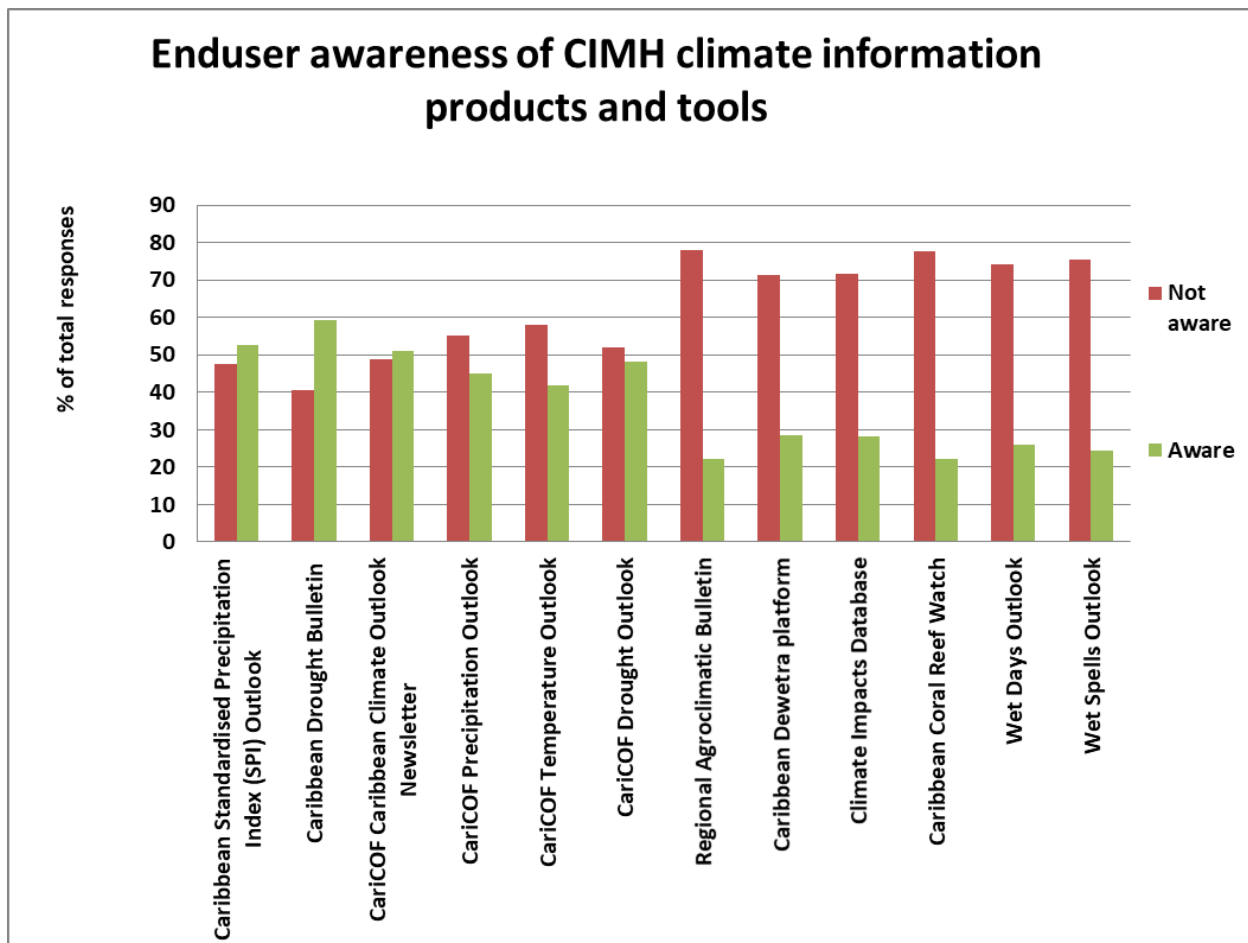


Figure 9. End-user Awareness of CIMH Climate Information, Tools and Products

Against this backdrop, the majority of end-users (85%) report that they try to routinely integrate climate information considerations into their decisions (Figure 10).

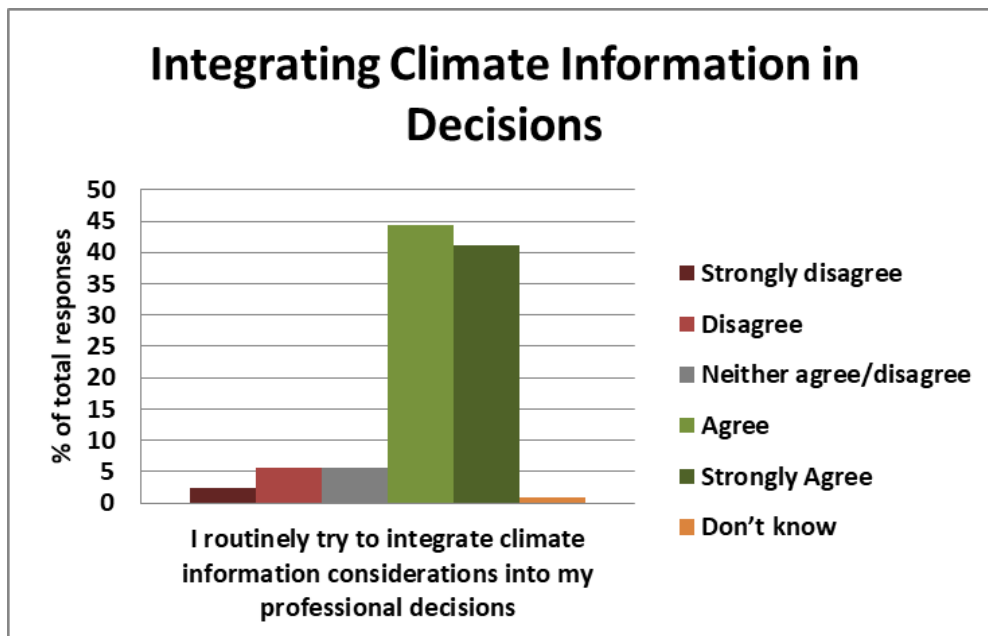


Figure 10. Integrating climate information in decisions

However, at least 70% of end-user organisations do not have the in-house climate expertise to assist them to competently do so (Figure 11).

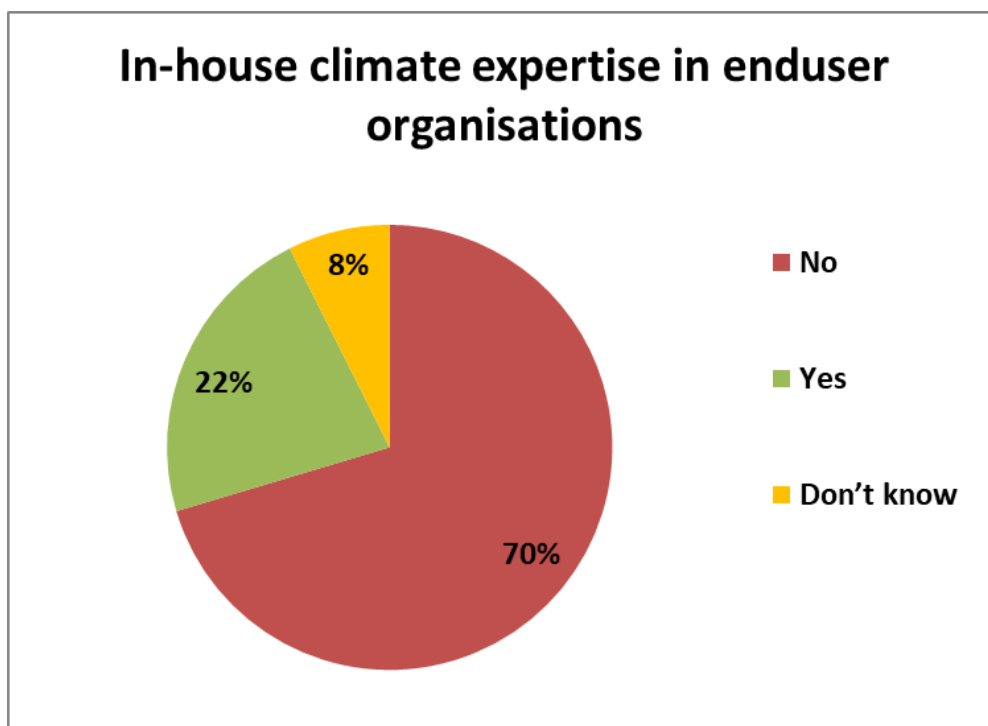


Figure 11. In-house climate expertise in end-user organisations

In fact, as much as 92% of respondents report that they need more exposure and training to build their capacity to integrate climate information considerations into their professional decisions (Figure 12).

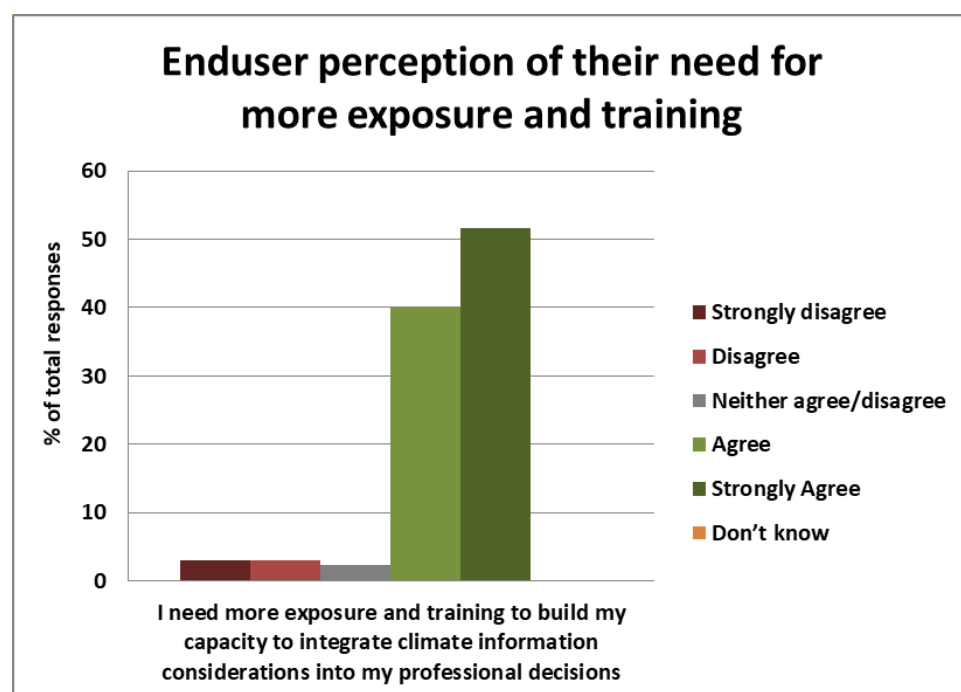


Figure 12. End-user perception of their need for more exposure and training in the use of climate information

The nature and quality of climate information

FGD and interview data revealed that there are several issues with the nature and quality of the suite of available climate information that made its use problematic for sectoral stakeholders. When grouped and classified, five distinct categories of deficiencies were clear: 1) Inadequate coverage of important variables, 2) Spatial resolution, 3) Technical language, 4) Format, and 5) Lack of information on impacts forecasting (Table 3).

Table 3. Deficiencies in the nature and quality of climate information

Category	Sector(s) that mentioned	Quote(s)
<i>Inadequate coverage of important variables</i>	Health	"...humidity is very important for health providers because it's directly related to proliferation of mosquitoes. And humidity is not always available..." (Health stakeholder, Dominica)

<i>Spatial resolution</i>	Agriculture, Water	<p>“...I do think that we need more local, more local, am, information products”. (Water stakeholder, St. Lucia)</p> <p>“what the Met service had initially was that they had their weather stations set up across the island but they were not necessarily in the agricultural production areas. So the information that you would get may not necessarily have been the best for a particular area...” (Agriculture stakeholder, Jamaica)</p>
<i>Technical language</i>	Agriculture, Water, DRM, Tourism	<p>“... sometimes you get things from scientists and it’s written in scientific speech... And if you want something that’s going to go to the sector, it needs to be in what a lot of us call plain English...” (Tourism stakeholder, Antigua)</p>
<i>Format (e.g. visual depiction of probabilistic maps)</i>	Agriculture, Water	<p>“some persons would understand what the different colours here may mean, right. Some people don’t understand that...” (Agriculture stakeholder, Barbados)</p> <p>“... that we are very good at developing content, but we are very poor at branding. Because sometimes we develop a message with the intent that people will read it and listen. And sometimes our messages need to be more graphical to catch people.” (Agriculture stakeholder, Barbados)</p>
<i>Lack of info on impacts forecasting</i>	Water, DRM	<p>“...in terms of hydrological drought, how does that translate to what actually happens on the ground? Because in the case of Dominica, we have a lot of water to begin with, the drought means we have a reduction in precipitation, but in terms of how that actually impacts what’s happening on the ground, that’s still another question..” (Water stakeholder, Dominica)</p> <p>“if I were to tell a minister, ‘you see next year, you’re going to have real drought’ or, ‘it’s going to, flooding for serious days’ and this that, ‘and the agriculture, we predicting this loss and whatever and whatever else, and speak a language that they understand, very simple terms, they’ll take notice.” (Agriculture stakeholder, Barbados)</p>

Provider-end-user relationship gaps

Limited, fluctuating attention paid by NMHSs to sectors: “....enhanced Met and Health collaboration.... have them playing a more key role...because it's not currently. The focus Met look at is hurricane season. But for me, it’s supposed to have an even more active role throughout on a yearly basis. It doesn't have to be only for hurricane season etc....” (Health stakeholder, St. Maarten); limited NMHS staff available to collaborate on climate services co-production: “...the challenge is how our Met Service ... is set up...it makes the availability of the staff to work along with us on projects outside of just weather issues... a challenge...” (Agriculture stakeholder, Grenada); as well as, NMHS reluctance to share data needed for co-production: “...The relationship needs to be improved on their end...because, they are not very keen on sharing data...” (Water stakeholder, Jamaica) were all issues raised by sectoral stakeholders when asked about the quality of the relationship/partnership for climate services.

On the user end of the spectrum, at least one end-user believes that the sector (in this case tourism) can do a better job forging a proactive relationship with the NMHS: “... I don't believe that the sector necessarily has a...proactive relationship....I don't think there is a relationship of understanding” (Tourism stakeholder, Antigua).

Enablers to sectoral climate information use

Two major enablers of sectoral climate information use were identified, namely: 1) an end-user’s own professional background and past experience: “Exposure ..., both in my first degree, second degree.... Because, environmental sciences, then water resources management and water quality management, and then due to exposure to... different courses and things at...the CIMH.” (Water stakeholder, St. Vincent and the Grenadines); as well as, 2) capacity building sessions such as CariCOF and other CIMH workshops: “ Well I would say, the CariCOFs have been very, very useful in actually helping me personally to overcome the interpretation of the information which has helped a lot. So, I would say that has really been useful in overcoming our ability to, to interpret and use the information and also we support the Coffee Industry Board in that way. So we have also built their capacity, to understand and utilise this information more. So that challenge has been removed or overcome.” (Agriculture stakeholder, Jamaica). It is interesting to note that both enablers were tied in some measure to capacity building initiatives coordinated by the CIMH.

IMPLICATIONS FOR FUTURE INVESTMENT

Despite the climate service provision challenges identified by NMHS and end-users alike, the data shows that among end-users, NMHSs outperform other major potential providers of climate information in the Caribbean on user interaction (Figure 13).

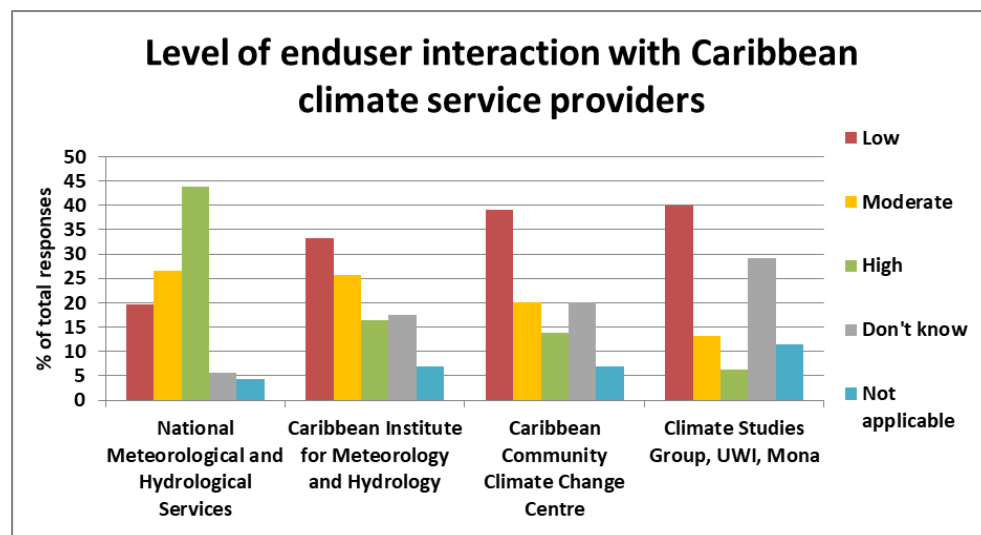


Figure 13. Level of end-user interaction amongst potential providers of climate information in the Caribbean

NMHSs also outperform all other sources of climate information, for all categories of climate information (Figure 14).

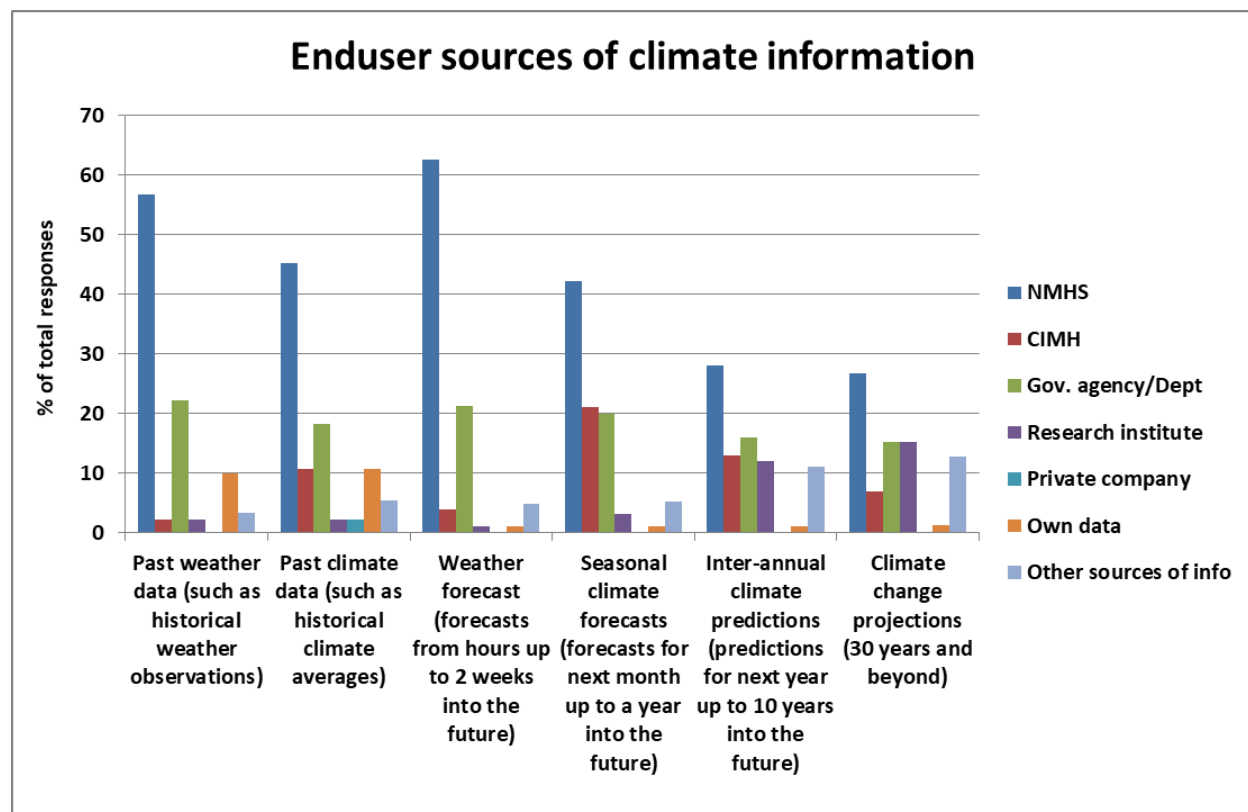


Figure 14. End-user Sources of weather and climate information

The NMHS therefore is a critical agent in the delivery of climate services, and focusing investment on NMHS capacity to produce and deliver tailored climate information is perhaps one of the most appropriate and impactful level of investment in the thrust to advance climate services development and delivery in the Caribbean.

Moreover, the analysis has revealed a clear role for Caribbean NMHSs and the CIMH as climate information providers going forward. Since 2017, in its newfound role as the WMO designated Caribbean RCC, the CIMH continues to advance regional climate services and GFCS implementation while supporting activities at national scales. The evidence suggests that investment into climate services in the Caribbean context should strategise around strengthening existing connections between different scales (regional, national and sectoral) of climate services where they already exist and establishing connections in cases where they do not. CIMH's thrust to support the NMHS and end-user communities in six climate-sensitive sectors in developing sectoral Early Warning Information Systems across Climate Timescales (EWISACTs) that seek to co-design, co-develop and co-deliver sector-specific climate information is therefore timely.

It is clear that there are several gaps on both the end-user and provider sides of the capacity spectrum that will have to be addressed. On the provider side, the results of this research suggest that investment in the NMHS community should take place across all five GFCS pillars, and particularly on Pillar 5 (Capacity Development) which emerged as one of the biggest concerns by NMHS respondents. In countries where all the income to the NMHS comes from central government (70% of the Caribbean sample) and the basic infrastructure, data and products that support the provision of climate services are generally provided through government funding, there has been no/very little change in governance and funding arrangements for weather and now climate services. Small, stagnant and/or declining economies and limited government budgets translate into limited resources available for investment in the development of climate services. NMHS representatives also stressed the importance of being empowered to engage in long-term institutional visioning: “I think we also have to think about structuring our offices and planning strategically for the challenges ahead. I think we need, at least for the small offices, we need that help to brainstorm as to how we should look as a service 10, 20 years down the road to meet the present-day challenges...” In this regard, NMHS representatives called for institutional strengthening through the development of a policy framework for climate services, complemented by strategic plans and associated financing for NMHSs that explicitly address capacity gaps. Due to its catalysing power, investing in addressing not only the issue of the legal mandate of the NMHSs but also funding and institutional arrangements while enhancing capacity in a number of operational areas that support the co-production of user-oriented climate information appears to be key to advancing action on GFCS implementation at national levels in the Caribbean.

On the end-user side, the research revealed the embryonic status of the awareness, as well as, appropriate application of climate science in climate-sensitive sectors in the Caribbean. This is particularly the case within tourism, energy and health sectors - raising the profile of these sectors as necessary future primary targeted beneficiaries of the next generation of climate services capacity building initiatives.

Research results also suggest that there is differentiated ability across end-user communities to interpret and use climate information, making the case for NMHSs to engage the sectors they serve in a sustained education process on climate. While sectors convene intra-sectoral meetings, at the national level, there are limited inter-sectoral meetings where climate information is shared, discussed and coordinated action is planned based on this information. Yet, the data has shown the inherent value of CariCOFs and CIMH Workshops in building capacity among end-users and NMHS staff alike, in unlocking end-user understanding of climate information products, as well as, in facilitating NMHS understanding of sectoral climate information needs. The role of the National Climate Outlook forum (NCOF) in providing a formal systematic interface between end-users and providers at the national level cannot therefore be overlooked. Another avenue for advancing climate literacy is through the development and operational dissemination of sector-specific climate bulletins that routinely translate the potential risks and opportunities associated with seasonal climate monitoring and forecast information to the specific operating context of sectors. While advances have been made at the regional level with the development and enhancement of targeted climate bulletins for the

agriculture, health and tourism sectors, national level downscaling of this information is necessary, as is the development of targeted climate bulletins for other climate-sensitive sectors.

Finally, as a result of progress made on advancing the development of Sectoral EWISACTs in the region, there is now growing consensus on the need to create a long-term cooperative arrangement in the form of a 10 year Sectoral EWISACTs Roadmap and Plan of Action through which Caribbean NMHSs and Caribbean climate-sensitive sectors will work together to better adapt to the challenges associated with climate variability and change. The Roadmap and Plan of Action (see Appendix 8) is intended to define the long-term collective investment priorities that guide the implementation of a coordinated, multi-sectoral climate services portfolio. This type of intervention is deemed to be necessary because weather, climate variability and climate change are already having and will continue to have severe impacts on national economies and key socio-economic sectors in the absence of integrated large scale, resilience interventions.

CONCLUSION

To the best of CIMH's knowledge, this is the first systematic assessment of Caribbean NMHS capacity across the five GFCS pillars. The mapping assessment has revealed that to varying extents, many countries lack the financial and human resources, political support, policies and appropriate institutional arrangements that hinder optimal performance on implementing areas critical to GFCS implementation in this region. These results facilitate targeted interventions by the CMO and its technical arm the CIMH to support capacity building for climate services provision at national levels.

This is also the first assessment of end-user capacity to use climate information. Findings on end-user perceptions of barriers to climate information application in decision-making can be used as a basis for prioritisation of investment into end-user capacity building, and provider capacity building to more effectively interface with diverse end-user communities.

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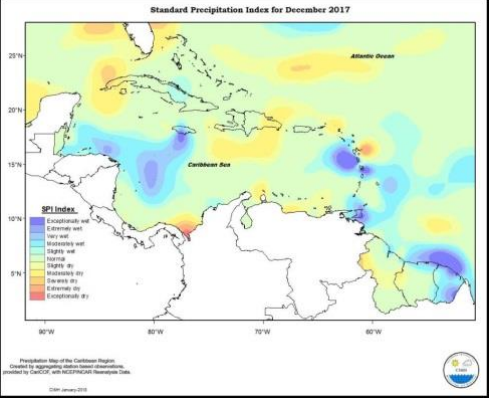
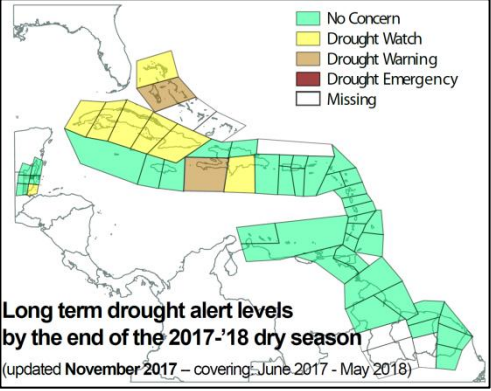
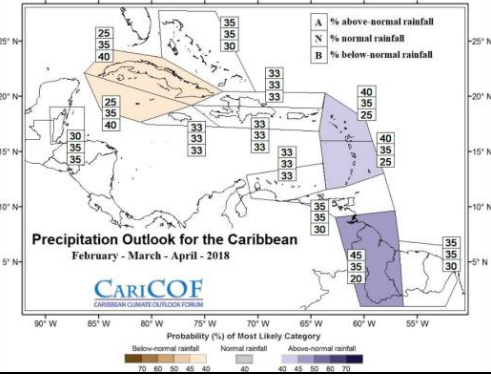
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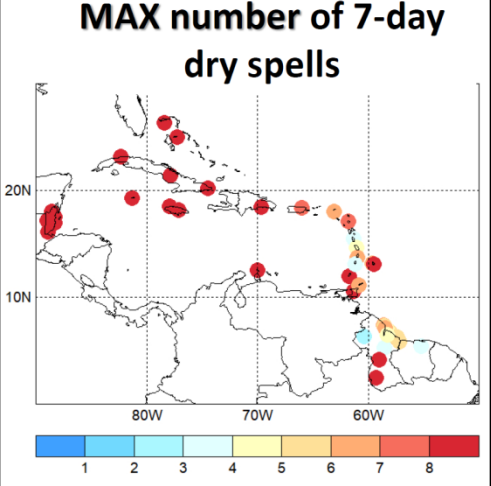
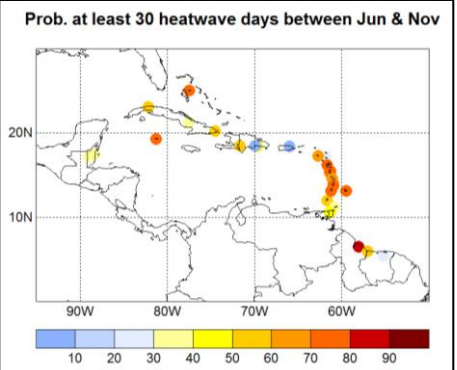
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APPENDICES

Appendix 1: CIMH's suite of regional climate information products

Product name	Figure	Description
Caribbean Drought and Precipitation Monitoring Network (CDPMN) Drought and Precipitation Monitors	 <p>Standard Precipitation Index for December 2017</p> <p>The map displays the Standard Precipitation Index (SPI) for December 2017 across the Caribbean region. The legend indicates SPI index values: -4 (Extremely wet), -3 (Very wet), -2 (Moderately wet), -1 (Slightly wet), 0 (Near normal), 1 (Slightly dry), 2 (Moderately dry), 3 (Very dry), and 4 (Extremely dry). The map shows varying levels of wetness and dryness across the Caribbean Sea and surrounding landmasses.</p>	Monitors ongoing rainfall deficits or excesses across the entire region over the past 1, 3, 6 and 12 months
Caribbean Climate Outlook Forum (CariCOF) Drought Alert Map	 <p>Long term drought alert levels by the end of the 2017-'18 dry season (updated November 2017 – covering June 2017 - May 2018)</p> <p>The map shows drought alert levels across the Caribbean region. The legend indicates five categories: No Concern (green), Drought Watch (yellow), Drought Warning (orange), Drought Emergency (red), and Missing (white). The map shows that most of the region is in the 'No Concern' or 'Drought Watch' category, with some areas in the 'Drought Warning' category.</p>	Provides an outlook of drought alert levels and corresponding action levels 3 months ahead of time, as well as, for the year
CariCOF Precipitation Outlook	 <p>Precipitation Outlook for the Caribbean February - March - April - 2018</p> <p>The map shows the probability (%) of most likely categories for precipitation outlook for the Caribbean region for February - March - April - 2018. The legend indicates three categories: Below-normal rainfall (orange), Normal rainfall (white), and Above-normal rainfall (blue). The map shows that the probability of below-normal rainfall is highest in the central and eastern Caribbean, while the probability of above-normal rainfall is highest in the western Caribbean.</p>	Predicts the overall amount of rainfall across the region for the next 3 to 6 months in terms of probabilities of being below-, near or above-normal with each category historically occurring as frequently

Product name	Figure	Description
CariCOF Temperature Outlooks	<p>Minimum Temperature Outlook for the Caribbean February - March - April - 2018 CariCOF Caribbean Coastal Outlook Center</p>	Predicts the overall the overall minimum, mean and maximum temperature across the region for the next 3 to 6 months in terms of probabilities of being below-, near or above-normal with each category historically occurring as frequently
CariCOF Wet Days and Wet Spells Outlook	<p>February to April 2018 Wet days Frequency shifts</p> <p>Frequency Shift decrease no change increase ○ little indication X missing</p>	States the historically expected numbers (i.e. frequency) of wet days, 3-day and 7-day wet spells during the next 3 months, as well as, their forecasted frequencies
Caribbean Coral Reef Watch	<p>CARIBBEAN CORAL REEF WATCH</p> <p>Notable Observations</p> <ul style="list-style-type: none"> La Niña conditions are predicted to continue (~65-75% chance) at least through the Northern Hemisphere winter 2017-18. Read more... Majority of the Eastern Caribbean under Bleaching Watch as SSTs cool. Bleaching Alert Level 2 issued for Nearshore Venezuela and La Guajira, Colombia. <p>Click here to track current conditions</p>	Tracks the current sea surface temperatures and maps regional thermal stress levels and coral bleaching potential with a lead time of 20 weeks

Product name	Figure	Description
CariCOF Dry Spells Outlook (Experimental)		States the historically expected numbers (i.e. frequency) of 7-day, 10-day and 15-day dry spells during the next 3 months, as well as, their forecasted frequency ranges, maximum number of possible dry spells and the probability of exceeding a given number of dry spells that may be detrimental to agricultural crop growth
CariCOF Heat Outlook (Experimental)		Maps the probability of a location to have at least 14, 30 or 60 heatwave days during the remainder of the warm season (roughly May to October, and to November in the Guianas) to give an indication of expected heat stress in coming months

Source: Mahon et al. (forthcoming)

Appendix 2: Profile of the CMO and CariCOF grouping of countries and territories

Country/ Territory	Status	CMO member	CariCOF technical outlook participation (* indicates participation in the CariCOF Forum)	Surface Area ^a (km ²)	Population ^a (000, 2017)	GDP Per Capita (US\$) ^a	Economic Activity (% of GVA, 2017)	Climate Exposure Index Category ^b
Anguilla	British overseas territory	Yes	Yes	91	15	21 879.6	Agriculture=2.3 Industry=15.7 Services and other activity=82.0	n.a.
Aruba	Dutch overseas territory	No	Yes	180	105	26 005.4	Agriculture= 0.5 Industry= 15.4 Services and other activity=84.1	n.a.
Antigua and Barbuda	Independent	Yes	Yes	442	102	14764.5	Agriculture= 1.9 Industry= 18.3 Services and other activity=79.8	high
The Bahamas	Independent	No	Yes	13940	395	22 817.2	Agriculture= 1.6 Industry= 12.7 Services and other activity=85.7	extreme
Barbados	Independent	Yes	Yes	431	286	15 429.4	Agriculture= 1.7 Industry= 12.1 Services and other activity=86.2	low
Belize	Independent	Yes	Yes	22 966	375	4 789.4	Agriculture= 14.6 Industry= 18.5 Services and other activity=66.9	high

Country/ Territory	Status	CMO member	CariCOF technical outlook participation (* indicates participation in the CariCOF Forum)	Surface Area ^a (km ²)	Population ^a (000, 2017)	GDP Per Capita (US\$) ^a	Economic Activity (% of GVA, 2017)	Climate Exposure Index Category ^b
British Virgin Islands	British overseas territory	Yes	No*	151	31	30 144.5	Agriculture= 1.0 Industry= 11.1 Services and other activity=87.8	n.a.
Cayman Islands	British overseas territory	Yes	Yes	264	62	62 132.0	Agriculture= 0.3 Industry= 7.5 Services and other activity=92.2	n.a.
Cuba	Independent	No	Yes	109 884	11 485	7 656.6	Agriculture= 5.0 Industry= 20.5 Services and other activity=74.5	extreme
Curacao	Dutch overseas territory	No	Yes	444	361.6	20 049.9	Agriculture= 0.5 Industry= 19.8 Services and other activity=79.8	n.a.
Dominica	Independent	Yes	Yes	750	74	7 051.1	Agriculture= 15.4 Industry= 13.2 Services and other activity=71.5	extreme
Dominican Republic	Independent	No	Yes	48 671	10 767	6 373.6	Agriculture= 6.6 Industry= 28.0 Services and other activity=65.4	extreme
French Guiana	French overseas territory	No	Yes	83 534	283	n.a	Agriculture= n.a Industry= n.a	n.a.

Country/ Territory	Status	CMO member	CariCOF technical outlook participation (* indicates participation in the CariCOF Forum)	Surface Area ^a (km ²)	Population ^a (000, 2017)	GDP Per Capita (US\$) ^a	Economic Activity (% of GVA, 2017)	Climate Exposure Index Category ^b
							Services and other activity= n.a	
Grenada	Independent	Yes	Yes	345	108	8 933.8	Agriculture= 8.3 Industry= 13.9 Services and other activity=77.8	low
Guadeloupe	French overseas territory	No	Yes	1 705	450	n.a	Agriculture= n.a Industry= n.a Services and other activity= n.a	n.a.
Guyana	Independent	Yes	Yes	214,969	778	4 278.8	Agriculture= 17.6 Industry= 31.7 Services and other activity=50.6	low
Haiti	Independent	No	Yes	27,750	10981	793.7	Agriculture= 16.7 Industry= 38.2 Services and other activity=45.1	extreme
Jamaica	Independent	Yes	Yes	10,990	2 890	5 105.8	Agriculture= 7.1 Industry= 22.3 Services and other activity=70.5	extreme
Martinique	French overseas territory	No	Yes	1 128	385	n.a	Agriculture= n.a Industry= n.a Services and other activity= n.a	n.a.
Montserrat	British overseas	Yes	No*	103	5	11 553.4	Agriculture= 1.4	n.a.

Country/ Territory	Status	CMO member	CariCOF technical outlook participation (* indicates participation in the CariCOF Forum)	Surface Area ^a (km ²)	Population ^a (000, 2017)	GDP Per Capita (US\$) ^a	Economic Activity (% of GVA, 2017)	Climate Exposure Index Category ^b
	territory						Industry= 12.7 Services and other activity=85.9	
Puerto Rico	U.S. territory	No	Yes	8 868	3 663	27 939.0	Agriculture= 0.8 Industry= 50.0 Services and other activity=49.1	n.a.
Saint Barthelemy	French overseas territory	No	Yes	n.a	n.a	n.a	Agriculture= n.a Industry= n.a Services and other activity= n.a	n.a.
St. Kitts and Nevis	Independent	Yes	Yes	261	55	15 771.9	Agriculture= 1.2 Industry= 28.1 Services and other activity=70.7	extreme
Saint Lucia	Independent	Yes	Yes	616	179	7 839.4	Agriculture= 2.7 Industry= 12.9 Services and other activity=84.4	low
Sint Maarten	Dutch overseas territory	No	Yes	34	40	28 241.7	Agriculture= 0.1 Industry= 12.3 Services and other activity=87.6	n.a.
Saint-Martin	French overseas territory	No	Yes	n.a	n.a	n.a	Agriculture= n.a Industry= n.a Services and other activity= n.a	n.a.

Country/ Territory	Status	CMO member	CariCOF technical outlook participation (* indicates participation in the CariCOF Forum)	Surface Area ^a (km ²)	Population ^a (000, 2017)	GDP Per Capita (US\$) ^a	Economic Activity (% of GVA, 2017)	Climate Exposure Index Category ^b
St. Vincent and the Grenadines	Independent	Yes	Yes	389	110	6 739.2	Agriculture= 7.5 Industry= 17.2 Services and other activity=75.3	low
Suriname	Independent	No	Yes	163,820	563	8 985.3	Agriculture= 11.4 Industry= 27.4 Services and other activity=61.1	low
Trinidad and Tobago	Independent	Yes	Yes	5,127	1369	19 062.9	Agriculture= 0.5 Industry= 42.5 Services and other activity=57.0	medium
Turks and Caicos Islands	British overseas territory	Yes	No*	948	35	25 121.8	Agriculture= 0.6 Industry= 10.4 Services and other activity=89.0	n.a.
US Virgin Islands	U.S. territory	No	Yes	347	105	n.a	Agriculture= n.a Industry= n.a Services and other activity= n.a	n.a.

^a United Nations (2017)

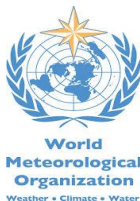
^b Maplecroft (2014). Climate Exposure Index evaluates the current risk of a territory being impacted by extreme climate-related events (drought, wildfires, tropical cyclones and storms, storm surge, severe local storms, precipitation induced landslides, flooding, and sea level rise). Index also incorporates risk posed by the projected changes in baseline climate parameters.

Note: n.a = Not available



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PROGRAMME
Programme for Building Regional Climate Capacity in the Caribbean



Appendix 3: Caribbean Climate Services Provider Baseline Survey

1. TELL US WHAT YOU THINK

You are invited to participate in a baseline survey to assess the capacity of the National Meteorological and Hydrological Services (NMHS) to deliver climate services in the Caribbean. Taking part in this survey will help advance existing knowledge about, among other things, NMHS capacity to implement the five pillars of the Global Framework for Climate Services (GFCS), namely: 1) Observations and Monitoring (OBS), 2) Research, Modelling and Prediction (RMP), 3) the Climate Services Information System (CSIS), 4) the User Interface Platform (UIP), and 5) Capacity Development (CD). The data collected for this study may be used as a baseline against which similar future research may be compared.

2. YOUR PARTICIPATION

Your participation in this study is voluntary and will involve taking approximately 60 minutes to complete the questionnaire that follows.

3. ABOUT CLIMATE INFORMATION AND SERVICES

Climate information refers to knowledge and advice about the past, present and future characteristics of the Earth's climate at all relevant time and space scales. It is a broad term that, from a practical standpoint, includes summary statistics of climatic variables (e.g., rainfall, temperature, wind, etc.); historical time-series records; near-real-time monitoring; predictive information from daily weather to seasonal to inter-annual timescales; and climate change scenarios. It can include derived variables related to impacts, such as drought indices, or an UV exposure index. Climate information can also provide insight on potential future conditions to stakeholders whose activities and operations are affected by weather and climate. In this context, climate services are climate information that is tailored, packaged and delivered to meet the specific needs of users.

This survey is being conducted by the Caribbean Institute for Meteorology and Hydrology (CIMH) under the Programme for Building Regional Climate Capacity in the Caribbean (BRCCC Programme) with funding made possible by the generous support of the American People, through the United States Agency for International Development (USAID).

If you would like to receive further information on the findings of this research or would like to join the BRCCC mailing list, please leave your email address below:

For more information on the Caribbean Regional Climate Centre (RCC) and the Programme for Building Regional Capacity in the Caribbean (BRCCC Programme), please visit: <http://rcc.cimh.edu.bb/>.

START HERE

Section A: General information on you and your organisation

1. Name of your organisation: _____

2. In which country is your NMHS located? Please tick one.

- | | |
|---|---|
| <input type="checkbox"/> Anguilla | <input type="checkbox"/> Antigua and Barbuda |
| <input type="checkbox"/> Barbados | <input type="checkbox"/> Belize |
| <input type="checkbox"/> British Virgin Islands | <input type="checkbox"/> Cayman Islands |
| <input type="checkbox"/> Dominica | <input type="checkbox"/> Grenada |
| <input type="checkbox"/> Guyana | <input type="checkbox"/> Jamaica |
| <input type="checkbox"/> Montserrat | <input type="checkbox"/> St. Kitts and Nevis |
| <input type="checkbox"/> Saint Lucia | <input type="checkbox"/> St. Vincent and the Grenadines |
| <input type="checkbox"/> Trinidad and Tobago | <input type="checkbox"/> Turks and Caicos Islands |
| <input type="checkbox"/> Other (please specify) _____ | |

3. In what year was the NMHS established: _____

4. What are your organisation's major areas of responsibility? Please tick all relevant boxes.

- | | |
|---|--------------------------------------|
| <input type="checkbox"/> Meteorology | <input type="checkbox"/> Climatology |
| <input type="checkbox"/> Hydrology | <input type="checkbox"/> Research |
| <input type="checkbox"/> Other (please specify) _____ | |

5. What is the technical capacity of your organisation?

- | | |
|--|--|
| <input type="checkbox"/> < 5 technical staff | <input type="checkbox"/> 6-10 technical staff |
| <input type="checkbox"/> 11-15 technical staff | <input type="checkbox"/> 16-20 technical staff |
| <input type="checkbox"/> >20 technical staff | |

6. Does your organisation deliver climate information that is tailored, packaged and delivered to meet the specific needs of users? Please tick one.

- | | |
|-------------------------------------|------------------------------|
| <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| <input type="checkbox"/> Don't know | |

7. If Yes, how long has your organisation been engaged in delivering tailored climate information?

- | | |
|---------------------------------------|---|
| <input type="checkbox"/> < 1 year | <input type="checkbox"/> 1 to 3 years |
| <input type="checkbox"/> 4 to 5 years | <input type="checkbox"/> 6 to 10 years |
| <input type="checkbox"/> >10 years | <input type="checkbox"/> Other (please specify) _____ |

8. Does your organisation tailor the following regional climate products for the national context? Please tick one.

	Yes	No	Don't know
Caribbean Standardised Precipitation Index (SPI) Outlook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caribbean Drought Bulletin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CariCOF Caribbean Climate Outlook Newsletter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CariCOF Precipitation Outlook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CariCOF Temperature Outlook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CariCOF Drought Outlook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regional Agroclimatic Bulletin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If yes, please specify what national level products are produced:

9. Are there any other organisations you are aware of that deliver climate services in your country? Please tick one.

- ☐ **Yes**
☐ **No**
- ☐ **Don't know**

If yes, please specify:

10. Which category of climate service provision best describes your organisation? Please tick one.

- | | |
|--|---|
| <input type="checkbox"/> Category 1: A basic range of climate data services and information products (e.g., climate observations, climate data management, climate monitoring) | <input type="checkbox"/> Category 3: A comprehensive range of climate data services and information products (e.g., all Category 2 services plus provision of specialized climate products and decadal climate prediction) |
| <input type="checkbox"/> Category 2: Essential climate data services and information products (e.g., all Category 1 services plus provision of seasonal climate outlooks, interaction with users) | <input type="checkbox"/> Category 4: Provision of advanced climate service (e.g., all Category 3 services plus the provision of long-term climate projections, customized climate products and climate application tools) |
| <input type="checkbox"/> Don't know | |

11. What are the main sources of funding for your organisation? Please tick all relevant boxes.

- | | |
|--|--|
| <input type="checkbox"/> Government | <input type="checkbox"/> Commercial activities |
| <input type="checkbox"/> Cost recovery (e.g., for provision of aviation services) | <input type="checkbox"/> Other (please specify) _____ |

12. Please tick the box that best describes your position in your organisation.

- | | |
|--|--|
| <input type="checkbox"/> Chief Executive/Director | <input type="checkbox"/> Met forecaster |
| <input type="checkbox"/> Climate forecaster/Climatologist | <input type="checkbox"/> Observer/Met assistant |
| <input type="checkbox"/> Met instrument technician | <input type="checkbox"/> Researcher |
| <input type="checkbox"/> Other (please specify) _____ | |

13. Have you attended previous Caribbean Climate Outlook Forum (CariCOF) sessions or any other regional climate workshop organised by CIMH (e.g., a drought workshop)? Please tick one.

- ☐ **Yes** ☐ **No**

If Yes, please specify how many sessions you have attended: _____

14. How has attendance at CariCOF sessions or any other regional climate workshop organised by CIMH impacted your NMHS's ability to design and deliver climate services? Please rate your agreement with the following statements:

	Strongly agree	Agree	Neither agree/disagree	Disagree	Strongly disagree	Don't know	Not applicable
CariCOF attendance has increased the NMHS ability to innovate products for our national context	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The staff at my organisation need more exposure and/or training provided by the CariCOF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section B: Service-specific information

15. Please describe 1-3 climate products and/or services delivered by your organisation.

PRODUCT OR SERVICE A	
Name of product/service:	
Purpose:	
Geographic scale (e.g., parish level etc.):	
Temporal resolution:	
Climate data used:	

Socio-economic data used:	
Users:	
Dissemination mode (e.g., bulletin, advisory, if web-based, include URL):	
Dissemination frequency:	
How stakeholders use product/service	

PRODUCT OR SERVICE B	
Name of product/service:	
Purpose:	
Geographic scale (e.g., parish level etc.):	
Temporal resolution:	
Climate data used:	
Socio-economic data used:	
Users:	
Dissemination mode (e.g., bulletin, advisory, if web-based, include URL):	
Dissemination frequency:	
How stakeholders use product/service	

PRODUCT OR SERVICE C	
Name of product/service:	
Purpose:	
Geographic scale (e.g., parish level etc.):	
Temporal resolution:	
Climate data used:	
Socio-economic data used:	
Users:	

Dissemination mode (e.g., bulletin, advisory, if web-based, include URL):	
Dissemination frequency:	
How stakeholders use product/service	

16. What recommendations would you make for the improvement of the availability of the range of climate products and/or services in your country?

Section C: Decision Support Systems

17. Are you aware of the Caribbean Dewetra platform? Please tick one.

- ☐ Yes ☐ No

If Yes, approximately how often do you use the Caribbean Dewetra platform to perform your duties? Please tick one.

- ☐ Everyday ☐ Every week
☐ Every month ☐ Every 6 months
☐ Every year ☐ Less than once a year
☐ Never

Section D: Observation and Monitoring

Observations and Monitoring: Scientific and technical systems that ensure that climate observations and other data, including metadata, required to meet the wants and needs of end users are collected, managed, disseminated and its utility assessed.

18. Does your organisation have an observational programme for the following essential atmospheric climate variables? Please tick all relevant boxes.

	Yes	No	Don't know	Not applicable
Surface air temperature	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Surface wind speed and direction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Humidity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Surface pressure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Precipitation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Yes	No	Don't know	Not applicable
Sunshine duration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Incoming solar radiation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Upper air wind speed and direction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cloud properties	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. Does your organisation have a Climate Database Management System (CDMS) in place?

- ☐ Yes
 ☐ No
 ☐ Don't know

20. Please rate your level of agreement with the statements below by ticking the relevant boxes:

	Strongly agree	Agree	Neither agree/disagree	Disagree	Strongly disagree	Don't know	Not applicable
My organisation's CDMS capability is good	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There are major gaps in climate observations in my country	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
National observational data coordination mechanisms such as National Climate Observing Coordinators and/or Observing Committees are established and functional	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There is a need to rescue, digitize and develop historical climate data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My organisation makes observations, data, and observational products (including historical data and products) available as a public service	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We conduct regular assessments of requirements for climate data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We routinely conduct observing system capability analyses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My organisation's capacity to ingest, quality control, backup, and manage observational/climate data is good	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Policies for open and broad access to all data needed for providing climate services exist	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There is a need to better understand data and product needs of sectors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We routinely translate data and product needs from users into specific observational requirements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. What recommendations would you make for the improvement of the Observation and Monitoring capability in your country?

Section E: Research, Modelling and Prediction

Research, Modelling and Prediction: Scientific and technical systems that foster research towards continually improving the scientific quality of climate information and services, providing an evidence base for the impacts of climate change and variability and for the value of using climate information.

22. Does your organisation engage in the following activities? Please tick the relevant boxes.

	Yes	No	Don't know	Not applicable
Applied research regarding the direct effects of climate conditions on sectors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Production of sector specific climate indices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research on observations, their processing and climate record production	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research on climate predictability and improving the skill of prognostic information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research on adding value to climate information for its use in services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research on the value of climate services, monetary or otherwise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. Are the following arrangements to support research, modelling and prediction in place at your organisation? Please tick all relevant boxes.

	Yes	No	Don't know	Not applicable
A research division of the NMHS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Funding support for research in sector and climate applications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A long-term research strategy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate databases for individual sectors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Established research partnerships with universities and academies of science, research laboratories or various national agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24. What recommendations would you make for the improvement of the Research, Modelling and Prediction capability in your country?

Section F: Climate Services Information System

Climate Services Information System: The mechanism through which information about climate (past, present and future) is routinely collected, stored and processed to generate and deliver products and services that inform often complex decision-making.

25. Does your organization engage in the following activities? Please tick the relevant boxes.

	Yes	No	Don't know	Not applicable
Climate observations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate data management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interaction with users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Development of seasonal climate outlooks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate monitoring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Development of specialized climate products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Providing decadal climate prediction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Providing long-term climate projections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Development of tailored climate products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Development of climate application tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate data rescue, management and mining	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate impacts reporting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

26. Please rate your level of agreement with the statements below by ticking the relevant boxes:

	Strongly agree	Agree	Neither agree/disagree	Disagree	Strongly disagree	Don't know	Not applicable
My organisation's capacity to acquire, interpret and apply data and products provided by regional centres is good	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We develop our own national outlook products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We have a process of regular review and update of user requirements for climate data, products and information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We develop and deliver routine climate monitoring products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My organisation participates in standardized management and exchange of climate and climate-related data as per WMO resolutions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My organisation's capacity to provide climate information and products to general and specialist users is good	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My organisation's capacity to provide advice on the interpretation and use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Strongly agree	Agree	Neither agree/disagree	Disagree	Strongly disagree	Don't know	Not applicable
<hr/> of climate information is good <hr/>							

27. What recommendations would you make for the improvement of the Climate Information System capability in your country?

Section G: User Interface Platform

User Interface Platform: A structured means for users, climate researchers and climate information providers to interact at all levels.

28. Please indicate which socio-economic sectors currently benefit from climate services in your country by ticking the relevant boxes:

- | | |
|--|---|
| <input type="checkbox"/> Agriculture | <input type="checkbox"/> Water |
| <input type="checkbox"/> Disaster risk management | <input type="checkbox"/> Health |
| <input type="checkbox"/> Energy | <input type="checkbox"/> Tourism |
| <input type="checkbox"/> Other (please specify) _____ | |

In addition to the sectors identified above, please indicate which sectors you believe could potentially benefit from climate services in your country:

29. Does a National Climate Outlook Forum (NCOF) exist in your country? Please tick one.

- | | |
|--|------------------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| <input type="checkbox"/> Don't know | |

30. Please rate your level of agreement with the statements below by ticking the relevant boxes:

	Strongly agree	Agree	Neither agree/disagree	Disagree	Strongly disagree	Don't know	Not applicable
We interact with users to meet their requests for answers to basic climatology questions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We interact with users to identify and evaluate their need for, and to provide advice on, climate information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We assist users in interpreting and using climate predictions and products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We routinely obtain feedback from users on the usefulness and effectiveness of the information and services provided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

31. Please specify the user groups with which you interact:

User group 1: _____
 User group 2: _____
 User group 3: _____
 User group 4: _____
 User group 5: _____

32. How would you rate the level of interaction between users of climate services and your organisation? Please tick one.

High (users are engaged from the development stage of the climate service project and are continually engaged throughout later stages)	<input type="checkbox"/>
Moderate (users are engaged at later stages in the climate service project)	<input type="checkbox"/>
Low (users are not engaged during the climate service project)	<input type="checkbox"/>

33. Is feedback routinely collected from users? Please tick one.

☐ Yes ☐ No
☐ Don't know

If yes, through which channels is feedback collected? Please tick all the relevant boxes.

<input type="checkbox"/> Outreach Workshops	<input type="checkbox"/> National Climate Outlook Forums
<input type="checkbox"/> Email	<input type="checkbox"/> Telephone hotline
<input type="checkbox"/> Surveys	<input type="checkbox"/> Interviews
<input type="checkbox"/> Face-to-face discussion	<input type="checkbox"/> Online discussion forums

- ☐ Working Groups
☐ Other (please specify) _____

☐ Meetings/seminars

34. What are the barriers to producing the kinds of information that users want? Please rate your level of agreement by ticking the relevant boxes.

	Strongly agree	Agree	Neither agree/disagree	Disagree	Strongly disagree	Don't know	Not applicable
Lack of documentation of user needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of appropriate applied models for sectors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of finer resolution data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inadequate communication between the NMHS and users of climate information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of institutional incentive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of funding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The amount of time and effort it takes to build relationships with users and to understand their needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Users require climate information in shorter timeframes than can be produced by my organisation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The time and effort it takes for users to understand the caveats of the information being provided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

35. Does your organisation collaborate with others regarding climate services? Please tick one.

- ☐ Yes
☐ Don't know
☐ No

If Yes, with whom does your organisation collaborate?

36. Please rate your organisation's level of interaction with the following Caribbean climate institutions by ticking the relevant boxes:

	High	Moderate	Low	Don't know	Not applicable
Caribbean Institute for Meteorology and Hydrology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caribbean Community Climate Change Centre	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate Studies Group, UWI, Mona	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Institute of Meteorology, Cuba (INSMET)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

37. What recommendations would you make for the improvement of the User Interface Platform capability in your country?

Section H: Capacity Development

Capacity Development: Mechanisms that support the interpretation, translation and use of climate information to support decision making; identified in the other pillars.

38. What areas do you consider in need of development at the national level? Please rate your level of agreement by ticking the relevant boxes.

	Strongly agree	Agree	Neither agree/disagree	Disagree	Strongly disagree	Don't know	Not applicable
Enhancing the monitoring infrastructure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Automation of the observing networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improving operational forecasts including the warning products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strengthening operational forecasting capacity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extending climate services to new user sectors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training and education of staff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improving IT (including better use of web services and social media)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improving management and institutional arrangements for climate services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improving research and development for climate services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Establishing and/or strengthening avenues of interaction between climate service providers and users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

39. How would you rate your organisation's capacity to engage in the following activities?

	High	Moderate	Low	Don't know	Not applicable
Climate observations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate data management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interaction with users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	High	Moderate	Low	Don't know	Not applicable
Development of seasonal climate outlooks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate monitoring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Development of specialized climate products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Providing decadal climate prediction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Providing long-term climate projections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Development of customized climate products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Development of climate application tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate data rescue, management and mining	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate impacts reporting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

40. What recommendations would you make for the improvement of the Capacity in your country?

Section I: Sustainability

41. Please rate the usefulness of the following proposed outputs of the BRCCC Programme to the advancement of sectoral climate early warning information in your country by ticking the relevant boxes:

	Very useful	Useful	Neither usable nor not useful	Not useful	Not useful at all	Don't know	Not applicable
Sector specific climate service webpages on the CIMH website	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sector specific communication packages of multi-media materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sector specific sessions at the CariCOF 2015-2016	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sector specific impact models	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caribbean Dewetra User Toolkit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Online Caribbean Dewetra module	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caribbean Dewetra training workshops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sector specific Outreach Workshops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Baseline information regarding user needs for climate services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Baseline information regarding provider capacity to deliver climate services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Development of a 10 year sectoral EWISACTs Plan of Action	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research on how climate negatively/positively impacts climate-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Very useful	Useful	Neither usable nor not useful	Not useful	Not useful at all	Don't know	Not applicable
sensitive sectors							
Interface tool in the Climate Impacts Database enabling users to correlate forecasts to past impacts and appropriate response strategies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sector specific climate product prototypes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sector specific climate products integrated into the Caribbean Dewetra platform	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Case studies demonstrating how existing climate information has improved sectoral decision-making	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monthly sectoral EWISACTs bulletins	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

42. Please rate your level of agreement with the statements below by ticking the relevant boxes:

	Strongly agree	Agree	Neither agree/disagree	Disagree	Strongly disagree	Don't know
Climate services are of little value to the Caribbean	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate services should be provided free of charge on a regular basis through electronic media	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Users should be able to gather climate information on their own at a user-friendly and easily accessible website	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The Caribbean should continue to invest in building its climate services capacity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A regional framework for climate services is desirable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My organisation is willing to participate in a process to develop a regional framework for climate services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My organisation is in a position to self-fund the NCOF process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My organisation is in a position to self-fund our participation in the CariCOF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

43. What level of involvement would you/your organisation like to have with the BRCCC Programme (which will run to January 2017)? Please tick the relevant boxes.

	Yes	No	Maybe	Don't know
Participate in future outreach and training workshops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Take part in interviews with the research team	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Participate in the testing of climate product prototypes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provision of sectoral datasets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

44. If there is anything about the delivery of climate services at the national level that you would like us to consider, please feel free to let us know below:

Thank you for taking the time to complete our questionnaire!

Appendix 4: CARICOF CLIMATE SERVICE PROVIDER FOCUS GROUP PROTOCOL

Research Task: To conduct focus groups with climate service providers at the 2016 May CariCOF.

Research Goal: To better understand the capacity of climate service providers and how they tailor their products to meet the needs of their stakeholders and influence decision-making.

Research Outcome: An archive of existing climate information products and services available in the Caribbean; insight into the supply and demand of climate products and services; best practices as it relates to tailoring products; promote social learning among participants

Overarching Research Question:

What are the enabling factors or barriers that have shaped climate information supply and demand?

Focus Groups Organization:

- As there will be approximately 20 meteorologists/climatologists in attendance at the CariCOF, there will be 2 two focus group.
- One moderator per group with 2 tape recorders (1 as a failsafe). If possible, it would be advisable to assign a note-taker/assistant per group as well.

Facilitator Role:

It's important to recognize that the "questions" below are simply a guide meant to show the logic. Each groups dynamics and the flow of the conversations will ultimately dictate how the facilitators guide the groups. We ultimately want to know how climate has and will impact decisions, and what those decisions are. Getting there may likely take on different paths.

Responsibilities of Rapporteur:

- While the FGD will be recorded, it is important to capture the notes as comprehensively as possible in case the recorder fails and because it can help us interpret the transcriptions.
- Make 3 kinds of notes during the conversation: (1) direct quotes—demarcated by “”—of statements that you feel are poignant and capture an important concept in a clear and, ideally, eloquent way; For direct quotes, note the speaker so the comment can be attributed later in some way; (2) paraphrases of comments (this will be the vast majority); (3) your observations, these can include group dynamics like (X is dominating) to more analytical interpretations like “many people feel uncomfortable with discussing X”).
- Make sure to note down who attends the group; we'll want this information for a description of the attendees in our methods section. Draw the seating arrangement.

Focus Group Introduction:

- Introduce moderator/assistant
- The purpose of this focus group is to get your perspectives on how the demand for climate information is changing and how that influences what you do. We're interested in capturing enabling and constraining factors. As you know, we're also conducting discussions with the sector groups to hear their perspectives on how seasonal climate affects their decision-making. Combined, we'll obtain a picture of the opportunities for seasonal information to inform decisions, as well as, the constraints experienced in the use, provision and development of the

information. The ultimate goal is to figure out how CIMH can better support you so that climate information has a more widespread and beneficial impact.

- **Guidelines:**
 - We will allow no sidebars (separate conversations, or body-language sidebars like eye-rolling, snickering etc).
 - Listen actively- respect when others are speaking. Wait until your colleague finishes their contribution before speaking.
 - No right or wrong answers, only different points of view and experiences. Facilitator should encourage everyone to speak. If several people dominate the conversation, it's important to provide space for other perspectives.
 - Tape-recording - all answers anonymous, your name and institution will not be used, one person talks at a time.
 - Role of moderator is to ask questions and guide discussion, please speak directly to other members of the group.
 - Ask if participants have any questions and address them before proceeding.
- Ask participants to introduce themselves stating the organization they represent before starting the recording.

Topic Guide

Warm Up: Climate Product and Service Display Activity (15 mins)

Begin by referencing the Climate Service Provider Baseline survey implemented in 2015 that documented a list of existing climate products and services offered in the Caribbean. The survey was answered mainly by Directors who may not practice climatology in the NHMS. This activity seeks to validate the information gathered and provide an opportunity to add items that were not captured.

Step 1: A product display illustration (see figure below) will be posted on the wall outlining existing products delivered by national met services documented from the baseline provider survey. Focus group participants are invited to confirm the existence of these products and add any products that are not outlined.

Climate Product Suite	Antigua	Aruba	
Climate Product or Service A			
Climate Product or Service B			

Step 2: Participants are then asked to indicate if the products are generic or tailored to specific sectors by writing a 'G' on the product sheet or sticking the appropriate sector icon next to the product.

Demand (45 mins)

1. For this first question, we're interested in your views on how stakeholders perceive climate information. In your opinion, do they trust, use, or value climate information?
[facilitator: prompt specifically about agriculture, health and DRM sectors]
2. Have you observed any barriers to the use of climate information? [facilitator: prompt specifically about agriculture, health and DRM sectors] If you have, can you tell us what are they?
3. How can you address these barriers?

4. Within your countries, is interest in having access to climate information changing (increasing, decreasing, or just about the same interest)? If interest is changing, why do you think this is and who are the leading actors in this change (both increases, decreasing or just about the same interest)?
5. Do you monitor the use and interest of the climate information (eg. what specific decisions are supported by climate information) among sectoral users? If not, why not?
6. Do climatic conditions (including the recent El Niño) influence user interest?
7. Does interest in climate information vary during the year? What would be the stimulus for the highs and lows?

COFFEE BREAK

Supply (40 mins)

8. What climate information, if any, was available to sectoral stakeholders prior to 2009?
9. What climate information did your agency make available during the 2009/2010, 2015/2016 drought events (others)?
10. How have the changes in the interest in climate information affected you? [Facilitator: we are interested in both positive—makes it easier—and negative—makes it harder—responses]
11. How have the challenges and/or opportunities¹¹ in the development and provision of this information changed over the years?
12. How do you decide what climate information products to develop and deliver?

Tailoring (15 mins)

13. We often talk about “tailoring”? What does that mean for you? How do you do it? What are the challenges?
14. How do you tailor regional climate information to a national context?
15. [for those who tailor] how did you engage sectoral stakeholders in the design phase?
16. [for those who do not tailor] If you did not, why not?

Exit question (5 mins)

17. Can you think of any good examples that demonstrate the utility of climate information i.e How well have the products work for sectoral users in their decision making?

Closing script: We’ve heard great examples today about the use of climate information. Going forward we would like to document some of these experiences as case studies to share with others. Thank you so much for your participation today.

Focus Group Debriefing

To be held immediately after the FGD during lunch (May 31st, 2016).

¹¹ Opportunities here refer to national and regional interventions (projects, grants, budget).

Equipment Needed:

- ✓ 2 Flipchart Boards
- ✓ Roll of Flipchart paper
- ✓ Multi-coloured sheets of 8.5 x 11 paper
- ✓ 2 StickyWalls
- ✓ Adhesive Spray
- ✓ Duct tape
- ✓ Sectoral icons
- ✓ Markers
- ✓ Voice recorders
- ✓ Notepads
- ✓ Pens/pencils

Appendix 5: Caribbean Climate Services User Baseline Survey

1. TELL US WHAT YOU THINK

You are invited to participate in a baseline survey of user needs regarding climate services in the Caribbean. By taking part in this short survey, you will help advance existing knowledge of users' needs and potentially improve the provision and use of climate information in our region. The data collected for this study may be used as a baseline against which similar future research may be compared.

2. YOUR PARTICIPATION

Your participation in this study is voluntary and will involve taking 20 minutes to complete the questionnaire that follows. The questions ask for general information and opinions only and you are free to answer only the questions you prefer. There are no right or wrong answers.

3. ABOUT CLIMATE INFORMATION AND SERVICES

Climate information refers to knowledge and advice about the past, present and future characteristics of the Earth's climate at all relevant time and space scales. It is a broad term that, from a practical standpoint, includes summary statistics of climatic variables (e.g., rainfall, temperature, wind, etc.), historic time-series records, near-real-time monitoring, predictive information from daily weather to seasonal to inter-annual timescales, and climate change scenarios. It can include derived variables related to impacts, such as drought indices, or an UV exposure index. Climate information can also provide insight on potential future conditions to organizations whose activities and operations are affected by weather and climate. In this context, climate services are climate information that is tailored, packaged and delivered to meet the specific needs of users.

This survey is being conducted by the Caribbean Institute for Meteorology and Hydrology (CIMH) under the Programme for Building Regional Climate Capacity in the Caribbean (BRCCC Programme) with funding made possible by the generous support of the American People, through the United States Agency for International Development (USAID).

If you would like to receive further information on the findings of this research or would like to join the BRCCC mailing list, please leave your email address below:

For more information on the Caribbean Regional Climate Centre (RCC) and the Programme for Building Regional Capacity in the Caribbean (BRCCC Programme), please visit: <http://rcc.cimh.edu.bb/>.

START HERE

Section A: General information on you and your organization

45. Name of your organization: _____

46. In which country is your organization located? Please tick one.

- | | |
|---|---|
| <input type="checkbox"/> Anguilla | <input type="checkbox"/> Antigua and Barbuda |
| <input type="checkbox"/> Barbados | <input type="checkbox"/> Belize |
| <input type="checkbox"/> British Virgin Islands | <input type="checkbox"/> Cayman Islands |
| <input type="checkbox"/> Dominica | <input type="checkbox"/> Grenada |
| <input type="checkbox"/> Guyana | <input type="checkbox"/> Jamaica |
| <input type="checkbox"/> Montserrat | <input type="checkbox"/> St. Kitts and Nevis |
| <input type="checkbox"/> Saint Lucia | <input type="checkbox"/> St. Vincent and the Grenadines |
| <input type="checkbox"/> Trinidad and Tobago | <input type="checkbox"/> Turks and Caicos Islands |
| <input type="checkbox"/> Other (please specify) _____ | |

47. What is your organization's main sector of activity? Please tick one.

- | | |
|---|---|
| <input type="checkbox"/> Agriculture | <input type="checkbox"/> Water |
| <input type="checkbox"/> Health | <input type="checkbox"/> Disaster risk management |
| <input type="checkbox"/> Tourism | <input type="checkbox"/> Energy |
| <input type="checkbox"/> Other (please specify) _____ | |

48. What is the level of operation of the organization? Please tick one.

- | | |
|---|--|
| <input type="checkbox"/> International/transnational | <input type="checkbox"/> Regional |
| <input type="checkbox"/> National | <input type="checkbox"/> Community-based |
| <input type="checkbox"/> Other (please specify) _____ | |

49. How would you classify your organization? Please tick one.

- | | |
|--|--|
| <input type="checkbox"/> Government agency/department | <input type="checkbox"/> Private company |
| <input type="checkbox"/> Professional/trade association or group | <input type="checkbox"/> Research institution |
| <input type="checkbox"/> Non-governmental organization | <input type="checkbox"/> International organization (e.g. UN agency) |
| <input type="checkbox"/> Other (please specify) _____ | |

50. Does your organization currently employ any professionals that analyse climate information for application? Please tick one.

- | | |
|-------------------------------------|------------------------------|
| <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| <input type="checkbox"/> Don't know | |

51. Please tick the box that best describes your position in your organization.

- | | |
|---|--|
| <input type="checkbox"/> Chief Executive/Director | <input type="checkbox"/> Head of department/unit |
| <input type="checkbox"/> Scientist | <input type="checkbox"/> Technical expert |
| <input type="checkbox"/> Officer | <input type="checkbox"/> Researcher |

☐ Advisor/consultant

☐ Other (please specify) _____

52. Have you attended previous Caribbean Climate Outlook Forum sessions or any other regional climate workshop organised by CIMH (e.g., a drought workshop)? Please tick one.

☐ No

☐ Yes

If Yes, please specify how many sessions you have attended: _____

How has attendance at Caribbean Climate Outlook Forum sessions or any other regional climate workshop organised by CIMH impacted your professional decision-making? Please tick the relevant boxes.

	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly Agree	Don't know
I routinely try to integrate climate information considerations into my professional decisions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I need more exposure and training to build my capacity to integrate climate information considerations into my professional decisions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section B: Decision-making processes in your organization

53. How often does your organization plan for the following activities? Please tick the relevant boxes.

	Everyday	Every week	Every month	Every 6 months	Every 1 to 2 years	Every 3 to 6 years	Every 7 to 10 years	Never	Don't know
Operational and maintenance activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Activities based on the business plan/strategies of the whole organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Activities based on the corporate/capital investment of the organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other activities and operations (please specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

54. How often does your organization use the types of information listed below to plan its activities? Please tick the relevant boxes.

	Everyday	Every week	Every month	Every 6 months	Every year	Less than once a year	Never	Don't know
--	----------	------------	-------------	----------------	------------	-----------------------	-------	------------

Meteorological data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hydrological data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Economic data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Demographic data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Environmental data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

55. Please rate your level of agreement with the statements below by ticking the relevant boxes:

	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly Agree	Don't know
My organization plans for rare but severe weather events	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My organization plans for those climate risks that are most likely to occur	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My organization has clear guidelines on how much confidence in the climate information is required before we take action	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Time pressure means that sometimes we have to make decisions before we have as much information as we would like	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
What we really need is what will happen, not what might happen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We like to receive information in a form that helps us to make the right YES/NO decision	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section C: Use of weather and climate information

56. Does your organization use climate information? Please tick one.

- ☐ No
 ☐ Yes
 ☐ Don't know

If Yes, go to question 13. If No, go to question 18.

57. If Yes, how often does your organization use the following weather/climate information?
Please tick the relevant boxes.

	Everyday	Every week	Every month	Every 6 months	Every year	Less than once a year	Never	Don't know
Past weather data (such as historical weather observations)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Past climate data (such as historical climate averages)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Weather forecast (forecasts from hours up to 2 weeks into the future)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Seasonal climate forecasts (forecasts for next month up to a year into the future)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inter-annual climate predictions (predictions for next year up to 10 years into the future)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate change projections (30 years and beyond)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

58. Where does your organization obtain this weather/climate information? Please tick the relevant boxes.

	NMHS	CIMH	Gov. agency/ Dept.	Research institute	Private company	Own data (e.g. weather stations)	Other sources of info.	Don't know	Not applicable
Past weather data (such as historical weather observations)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Past climate data (such as historical climate averages)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Weather forecast (forecasts from hours up to 2 weeks into the future)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Seasonal climate forecasts (forecasts for next month up to a year into the future)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inter-annual climate predictions (predictions for next year up to 10 years into the future)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate change projections (30 years and beyond)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note: NMHS = National Meteorological and Hydrological Service

Please describe what other sources of weather/climate information your organization uses:

59. Please rate your organization's level of interaction with the following Caribbean climate information providers by ticking the relevant boxes:

	Low	Moderate	High	Don't know	Not applicable
National Meteorological and Hydrological Services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caribbean Institute for Meteorology and Hydrology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caribbean Community Climate Change Centre	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate Studies Group, UWI, Mona	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

60. How is the weather/climate information used in the organization? Please tick the relevant boxes.

	This information is analysed within the organization and then integrated in our models and/or research	The information is analysed outside the organization and then integrated in our models and/or research	The information is used to help inform and manage our day-to-day operational activities	The information is used to inform strategic planning	Don't know	Not applicable
Past weather data (such as historical weather observations)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Past climate data (such as historical climate averages)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Weather forecast (forecasts from hours up to 2 weeks into the future)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Seasonal climate forecasts (forecasts for next month up to a year into the future)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inter-annual climate predictions (predictions for next year up to 10 years into the future)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate change projections (30 years and beyond)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please describe in what other ways is this weather/climate information used in your organization:

61. How usable would the following new climate information and products be for planning management actions in your organization? Please tick the relevant boxes.

	Not usable at all	Not usable	Neither usable nor not usable	Usable	Very usable	Don't know	Not applicable
Bush fire outlook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heatwave outlook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hydrological outlook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A menu of sector specific response strategies associated with climate forecasts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What other climate information would be useful for your organization to have in order to manage its operations and activities?

62. If No, why does your organization not use climate information? Please rate your level of agreement with the statements below by ticking the relevant boxes:

	Strongly disagree	Disagree	Neither agree/ disagree	Agree	Strongly agree	Don't know
We do not know what climate information is available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The information available does not suit our needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The information available is not user friendly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We do not have in-house expertise to use this information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The level of detail provided is not appropriate to support organizational decisions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

63. Are you aware of the following available climate information, tools and products? Please tick one.

	Not aware	Aware
Caribbean Standardised Precipitation Index (SPI) Outlook	<input type="checkbox"/>	<input type="checkbox"/>
Caribbean Drought Bulletin	<input type="checkbox"/>	<input type="checkbox"/>
CariCOF Caribbean Climate Outlook Newsletter	<input type="checkbox"/>	<input type="checkbox"/>
CariCOF Precipitation Outlook	<input type="checkbox"/>	<input type="checkbox"/>
CariCOF Temperature Outlook	<input type="checkbox"/>	<input type="checkbox"/>
CariCOF Drought Outlook	<input type="checkbox"/>	<input type="checkbox"/>
Regional Agroclimatic Bulletin	<input type="checkbox"/>	<input type="checkbox"/>
Caribbean Dewetra platform	<input type="checkbox"/>	<input type="checkbox"/>
Climate Impacts Database	<input type="checkbox"/>	<input type="checkbox"/>
Caribbean Coral Reef Watch	<input type="checkbox"/>	<input type="checkbox"/>
Wet Days Outlook	<input type="checkbox"/>	<input type="checkbox"/>
Wet Spells Outlook	<input type="checkbox"/>	<input type="checkbox"/>

64. Please rate the usability of the following available climate information, tools and products to your organization's decision-making process by ticking the relevant boxes:

	Not usable at all	Not usable	Neither usable nor not usable	Usable	Very usable	Don't know	Not applicable
Caribbean Standardised Precipitation Index (SPI) Outlook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caribbean Drought Bulletin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CariCOF Caribbean Climate Outlook Newsletter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CariCOF Precipitation Outlook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CariCOF Temperature Outlook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CariCOF Drought Outlook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regional Agroclimatic Bulletin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caribbean Dewetra platform	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate Impacts Database	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caribbean Coral Reef Watch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wet Days Outlook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wet Spells Outlook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please provide us with at least one example of how you specifically use/integrate the above available climate information or tools or products in your organization's decision-making process:

Section D: Sustainability

65. Please rate your level of agreement with the statements below by ticking the relevant boxes:

	Strongly disagree	Disagree	Neither agree/ disagree	Agree	Strongly agree	Don't know
Climate services are of little value in my organization's operations and planning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate services should be provided free of charge on a regular basis through electronic media	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I would like to gather climate information on my own at a user-friendly and easily accessible website	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The Caribbean should continue to invest in building its climate services capacity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A regional framework for climate services is desirable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My organization is willing to participate in a	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix 6: CARICOF STAKEHOLDER FOCUS GROUP PROTOCOL

Research Task: To conduct focus groups with Agriculture, DRM, Health and other sector actors at the 2016 May CariCOF.

Research Goal: To better understand the scope and extent of how decision-making by Agriculture, DRM, Health and other sector stakeholders are affected by climate changes.

Research Outcome: Match (or tailor) existing or future climate information with information and service needs of stakeholders; promote social learning among participants.

Overarching Research Question:

What sectoral decisions (past, present or future) have been or will be affected by climate in the region?

Focus Groups Organization:

- As there are 5 moderators available, there will be 5 different groups: one group for Agriculture, DRM/other, Health, and two groups for met service.
- One moderator per group with 2 tape recorders (1 as a failsafe). If possible, it would be advisable to assign a note-taker/assistant per group as well.

Facilitator Role:

It's important to recognize that the "questions" below are simply a guide meant to show the logic. Each groups dynamics and the flow of the conversations will ultimately dictate how the facilitators guide the groups. We ultimately want to know how climate has and will impact decisions, and what those decisions are. Getting there may likely take on different paths.

Responsibilities of Rapporteur:

- While the FGD will be recorded, it is important to capture the notes as comprehensively as possible in case the recorder fails and because it can help us interpret the transcriptions.
- Make 3 kinds of notes during the conversation: (1) direct quotes—demarcated by “”—of statements that you feel are poignant and capture an important concept in a clear and, ideally, eloquent way; For direct quotes, note the speaker so the comment can be attributed later in some way; (2) paraphrases of comments (this will be the vast majority); (3) your observations, these can include group dynamics like (X is dominating) to more analytical interpretations like “many people feel uncomfortable with discussing X”).
- Make sure to note down who attends the group; we'll want this information for a description of the attendees in our methods section. Draw the seating arrangement.

Focus Group Introduction (5 mins):

- Introduce Moderator/Assistant
- The purpose of this focus group is to better understand the scope and extent of how decision-making by Agriculture, DRM, Health and other sector stakeholders are affected by climate changes.
- Guidelines

- We will allow no sidebars (separate conversations, or body-language sidebars like eye-rolling, snickering etc).
 - Listen actively- respect when others are speaking. Wait until your colleague finishes their contribution before speaking.
 - No right or wrong answers, only different points of view and experiences. Facilitator should encourage everyone to speak. If several people dominate the conversation, its important to provide space for other perspectives.
 - Tape-recording - all answers anonymous, your name and institution will not be used, one person talks at a time.
 - Role of moderator is to ask questions and guide discussion, please speak directly to other members of the group
 - Ask if participants have any questions and address them before proceeding.
- Ask participants to introduce themselves stating the organization they represent before starting the recording.

1. Warm Up Poster Exercise – Key activities influenced by climate (35 mins)

- This activity serves the purposes of (1) kicking off the FGD with an active participatory process, (2) providing data; and (3) providing information from which the following activity references and builds.
- There will be poster paper pasted on the walls and markers for individuals to write.
- Facilitators should encourage participants to look at what others are writing in order to get jog their memories.
- In this exercise, participants are asked to identify 3 core activities in their sector (DRM or Health) that are affected by climate. Participants will write these three activities on 3 different sticky notes.
- Next, participants will identify which of the aforementioned activities are affected by different climate events. We will have colored stickers that each represents a different event (i.e. *drought/heatwave/flood/wildfire*). The participants will place the appropriate colors next to the activity.

2. Facilitated Discussion (using exercise 1 as a guide): Proposed Questions: (20 mins)

- Is climate information useful for any of these activities you listed?
- How have specific climate events in the past [facilitator refers to 2014-2016 drought, or asks individuals to recall a recent drought; other events facilitator points to are heat/above average precipitation] affected your activities? Refer to the activities from exercise 1 (*need examples of 'memorable' historical events*).

COFFEE BREAK

- During these past events, what were some of the decisions you made, or actions you took in your job in response to or in preparation of these climate events? (Have participants write their decisions and actions on 8.5 x 11 sheets of paper, yellow sheets for decisions, green sheets for actions). When did you make them? (Indicate on 12-month timeline) Examples: Did you increase spraying against mosquitoes because of increased precipitation? *Other examples – maybe the*

creation of a new programme, or a research initiative, or the facilitation of a new work group? Or new budgetary priorities? (30-45 mins).

- Did you consult climate information to inform any of these decisions [it will be important to try and separate and highlight separately climate and weather information]? Why or why not? What was the source of the information? (I guess we would want to know if people can actually point to particular climate information sources). If you did not use climate information, why not?
 - If you did, how did you monitor (formally/informally) the outcomes of your decisions based on the climate information? How effective were the decisions made and actions taken?
3. Can you think of any good examples that demonstrate the utility of climate information in your experience? i.e How well have the products have worked for you in your decision making? (10 mins)
4. Exit question – Is there anything else about how climate affects activities and decisions in your sector that we have not discussed yet and that would be important for us to know in our research? (5 mins)

Closing script: We've heard great examples today about the use of climate information. Going forward we would like to document some of these experiences as case studies to share with others. Thank you so much for your participation today.

Focus Group Debriefing

To be held immediately after the FGD during lunch (May 31st, 2016).

Equipment Needed:

- ✓ 3 Flipchart Boards
- ✓ Roll of Flipchart paper
- ✓ Multi-coloured sheets of 8.5 x 11 paper (yellow and green)
- ✓ Poster paper
- ✓ Sticky paper
- ✓ Coloured stickers
- ✓ Markers
- ✓ Voice recorders
- ✓ Notepads
- ✓ Pens/pencils

Appendix 7: Exploring the Use of Climate Information in Sectoral Decision-Making

Key Informant Interview Protocol

Introductory statement:

Good morning/afternoon (insert name). Thank you for agreeing to take part in this research study which seeks to explore your use of climate information in your professional decision-making.

None of the information you give me will be linked to you in anyway and you will not be identified as a respondent without your consent. During the rest of the session, I'll be working from a script to ensure that all of my questions to everyone who participates in this study are the same.

The study will require you to answer about 12 questions about the climate and climate information. By "climate" we mean information and conditions that summarize a period of time 2 weeks or more. This is different from "weather", which covers short periods like hours and days. The whole session is expected to take no more than 30 minutes.

I am going to record this session so that I have an accurate record of what was discussed, is that OK?

Do you have any questions before we begin?

Interview questions:

Ref.	Question
1	Can you please give me an overview of your professional role within your organization?
2	Please have a look at the risk related events identified on the sheet provided. Are there other risks that affect you or are important to you that are not on the list? Can you please rank the events in order of importance with 1 being the "most important" and 8 being the "least important"?
3	Can you tell me why you've ranked these events in the order that you've put them?
4	How likely is your organization to be affected by climate-related events such as drought, heatwave, flood and wildfire?
5	What impacts have climate-related events had on your operations in the past (whether it be positive or negative)? What impacts have climate-related events had on your sector in general in the past (whether it be positive or negative)?
6	What climate information do you currently use or have you ever used to make operational decisions? If yes, in what way have you used climate information? If no, why haven't you used climate information?
7	On a scale of 1-5 (with 1 being "not useful at all" and 5 being "very useful"), how useful is climate information to decisions that you make on a daily basis, weekly basis, monthly basis, seasonal basis etc.?
8	Are there any challenges that you have encountered with using climate information?
9	Did you ever change operational decisions as a result of considering climate information? If yes, which operational decisions did you change because you considered seasonal climate information? In what ways did you change those decisions?
10	Were there any changes (positive, negative, no change) in productivity outcomes as a result of your use of climate information? If there was any change, can you please tell me more about it?

11	What recommendations do you have for what should be the next climate information product or products? How can these new product(s) be best packaged for your use?
12	What is your relationship like with the national met service? What recommendations do you have for building or strengthening a collaboration between your sector and climate information providers such as your national met service or the CIMH?

This brings us to the end of this interview. Are there any other issues that you want to raise before we close off? We will share the results of the research with you in the near future as a token of our appreciation for your participation in this study.

If you have any further questions related to this research, please feel free to contact:

Dr. Roché Mahon rmahon@mail.cimh.edu.bb

Ms. Shelly-Ann Cox scox@cimh.edu.bb

Risk ranking list for question 3

	Risks	Rating
1.	Droughts	
2.	Financial and economic risks	
3.	Heat waves	
4.	Sargassum seaweed proliferation	
5.	Wildfires	
6.	Severe weather systems such as hurricanes	
7.	Vector borne diseases such as dengue, Chikungunya and Zika Virus	
8.	Floods	
	Other:	
	a.	
	b.	
	c.	

Appendix 8: Zero-Order Draft of Shared Logic Model: Sectoral EWISACTs Roadmap and Plan of Action

DRAFT GOAL, ULTIMATE OUTCOMES, INTERMEDIATE OUTCOMES

LEVEL	RESULTS		
Paradigm shift objective (30 year change)	To reduce and halt the incidence of weather and climate-related losses in key socio-economic sectors in the Caribbean.		
Consortium mission	Inter-institutional alliance for climate resilience among the agriculture, water, DRR, health, tourism and energy sectors.		
Roadmap guiding principles	• Better use of existing meteorological/climate services and information platforms; • Synergy across sectoral activities, structures and initiatives to implement the climate services agenda; • Consultation and partnership to identify, co-produce, co-implement and evaluate services; and • Inform and influence the regional and national resilience agenda.		
Roadmap goal (10 year change)	Increased climate resilience of sectoral infrastructure, activities and outcomes.		
Roadmap Ultimate Outcomes (10 year change)	Strengthened institutional arrangements for climate risk management (CRM) at regional, national and sectoral scales	Harmonised production systems for the generation of tailored, sector-specific climate information at regional and national scales	Improved sectoral decision-making for CRM at regional and national scales