Towards Baselining User Needs for Climate Services in the Caribbean:

Preliminary results from a survey of 2015 Wet Season CariCOF participants

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Abstract

At its core, climate services are climate information prepared and delivered to meet users' needs (WMO, 2013). Yet, knowledge regarding user needs in climate sensitive sectors in the Caribbean is not presently empirically robust. This Report presents the results of a preliminary study of sectoral needs for climate information using a non-random, convenience sample of thirty-two 2015 Wet Season CariCOF participants. Results on organizational decision-making processes, the use of weather and climate information in decision-making, the sources of different types of weather and climate information, and user perceptions of existing and proposed future climate products point to variations in climate information needs across sectors, as well as, a clear role for the National Meteorological and Hydrological Services and the Caribbean Institute for Meteorology and Hydrology as weather and climate information providers going forward.

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1. Introduction

At its core, climate services are climate information prepared and delivered to meet users' needs (WMO, 2013). At the global level of the Global Framework for Climate Services (GFCS), as well as, at the Caribbean regional level, there is a focus on the delivery of climate services to users in climate sensitive socio-economic sectors. While the GFCS identifies five (5) thematic areas (Agriculture and Food Security, Water, Disaster Risk Management, Health and Energy), the Caribbean has expanded its focus to six (Agriculture and Food Security, Water, Disaster Risk Management, Health, Energy and Tourism). This is logical since the principal income earners such as Tourism for the socio-economic development of many States are very reliant on its climatological pattern. The sectors are also sensitive to climate variability and weather extremes.

As a WMO designated Regional Climate Centre (RCC) in demonstration phase, the CIMH is expected to generate regional and sub-regional tailored products relevant to user needs. At the national level, climate providers such as the National Meteorological and Hydrological Services (NMHSs) are expected to play a similar role. CIMH's thrust to develop sectoral Early Warning Information Systems across Climate Timescales (EWISACTs) is therefore timely. Sectoral EWISACTs seek to design, develop and deliver sector specific climate information that enhances operational decision-making around climate.

Producing climate information in a form that can be readily used requires that the needs and capabilities of endusers to incorporate climate information into routine decisions is understood. Yet, knowledge regarding enduser needs in climate sensitive sectors in the Caribbean is not presently empirically robust. Some prior adhoc work documenting enduser needs has been done through Caribbean Climate Outlook Forums (CariCOFs) 2012-2014, the Regional Workshop on Climate Services at the National Level for the Caribbean convened in May 2013 in Port of Spain, Trinidad, (Trotman and Van Meerbeeck 2013), as well as, the International Research Applications Program (IRAP) Workshop convened in May 2014 (Guido et al., 2014). However, the process of documenting user needs has not been systematic and there are insufficient baselines to inform product tailoring and development for climate sensitive sectors. Since the Caribbean is formally at the start of its process of implementing the GFCS, a formal measurement of enduser needs is needed. This Report baselining user needs contributes to the systematic generation of knowledge on enduser needs. Such a systematic assessment has never been conducted before and will go a long way in increasing provider understanding of how climate information can be best integrated into sectoral decision-making.

2. The 2015 Wet Season Caribbean Climate Outlook Forum (CariCOF)

The Caribbean Climate Outlook Forum brings together national and regional meteorological service professionals and decision-makers to produce and discuss seasonal climate forecasts issued for June-August and September-November (Guido, Buizer et al. 2014). As a region

specific Regional Climate Outlook Forum (RCOF), the CariCOF is an example of a key User Interface Platform (UIP) under the GFCS.

The 2015 Wet Season CariCOF was convened on June 1-2, 2015. This forum brought together 32 provider participants (22 national, 10 regional) and 35 sectoral participants (22 national, 13 regional) and 9 "Other" participants (including international representatives). The Forum focused on presenting and discussing the 2015 Wet Season Climate Outlook, progress to date on the development of sectoral Early Warning Information Systems across Climate Timescales (EWISACTs), as well as, the IRAP Coffee Leaf Rust Project. Products launched at this meeting included the Wetdays/Wetspells Outlooks, the CariCOF Coral Reef Watch, and the Climate Impacts Database (CID).

3. Methods

This study involved the conduct of a questionnaire-based survey of sectoral participants at the 2015 Wet Season CariCOF. A standardized, structured survey instrument (see Appendix A) to suit the research purpose was developed based on a review of similar surveys of user climate information needs implemented in other regions of the world. Some survey questions were drawn from survey instruments used in the EU funded EUPORIAS and CLIM-RUN projects. Where necessary, these questions were adapted for the Caribbean context.

In total, there were approximately 29 major items organized under 8 question categories. Examples of question categories include those on organizational decision-making processes; the use of weather and climate information; sources of weather and climate information; perception of CariCOF; perception of BRCCC Programme Sectoral EWISACTs Proposed Outputs; and perception of the sustainability of climate services. These question categories were in addition to respondent profile questions. A 5-point Likert-type scale response format was adopted for most questions, as appropriate. However, there were exceptions including the use of nominal scales for profile questions and questions related to respondents' awareness of CIMH products, among others. In some instances, respondents were also given 'Don't Know' and 'Not Applicable' response options in an effort to include measurement of alternative meaningful opinions.

The draft paper-based questionnaire was tested in two phases. In the first phase, questionnaires were tested with staff at CIMH while the second test was conducted with a small number of sectoral users. Minor changes were made to the text of the questionnaire to increase respondent understanding.

Respondents for this survey were drawn from sectoral participants at the 2015 Wet Season CariCOF. Respondents' participation in the study was voluntary and involved taking 20 minutes to complete the questionnaire in a dedicated Agenda session on Day 1 of the 2015 Wet Season CariCOF. 33 of the 35 sectoral stakeholders that attended the COF participated in the survey.

One questionnaire was discarded due to insufficient response on questionnaire items, leaving 32 useable questionnaires and giving an effective response rate of 91%.

A coding sheet of questionnaire items, variable names and coding instructions was created to guide data entry. The paper-based questionnaires were coded and entered into Excel for analysis. Cells in Excel were left blank if data was missing. All data entries from the paper-based questionnaires were re-checked for consistency by two researchers on the research team. The entries were found to be largely consistent. Where there were errors, these were corrected.

The questions asked for general information and opinions only and respondents were free to answer only the questions they preferred. As a result, not all questions were answered by respondents. Thus, the data was analyzed using an available-case analysis approach. Frequencies were run on each survey item. In the reporting of survey results, percentages of the total number of respondents are reported versus absolute numbers. In addition, some questions limited respondents to one answer selection, while others allowed for multiple selections. This is also reflected in the reporting of results.

4. Results and Discussion

The following sections report and discuss the research results under 8 subheadings as follows:

1. Respondent profile;
2. Organization profile;
3. Organizational decision-making processes;
4. Use of weather and climate information;
5. Sources of weather and climate information;
6. Perception of CariCOF;
7. Perception of BRCCC Programme Proposed Sectoral EWISACTs Outputs; and
8. Perception of the sustainability of climate services.

4.1 Respondent profile

There were 32 respondents from 8 sectors in 11 countries. The sector most prominently represented was Water (32%) followed by Agriculture (26%) and DRM (23%) (Figure 1).

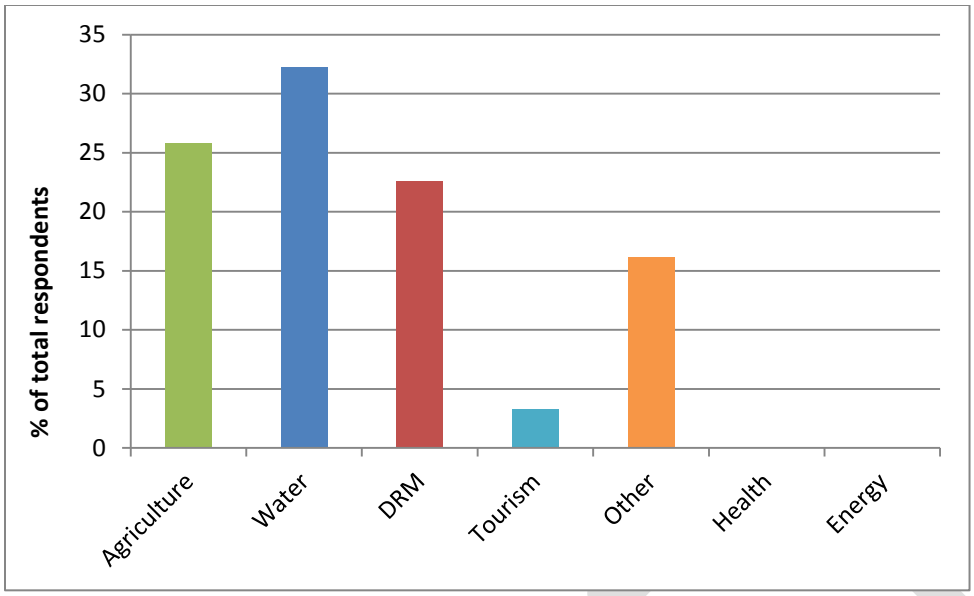

Figure 1. Respondents by sector

The majority of respondents were from Saint Lucia (23%) followed by Barbados (13%) and Grenada (13%) (Figure 2).

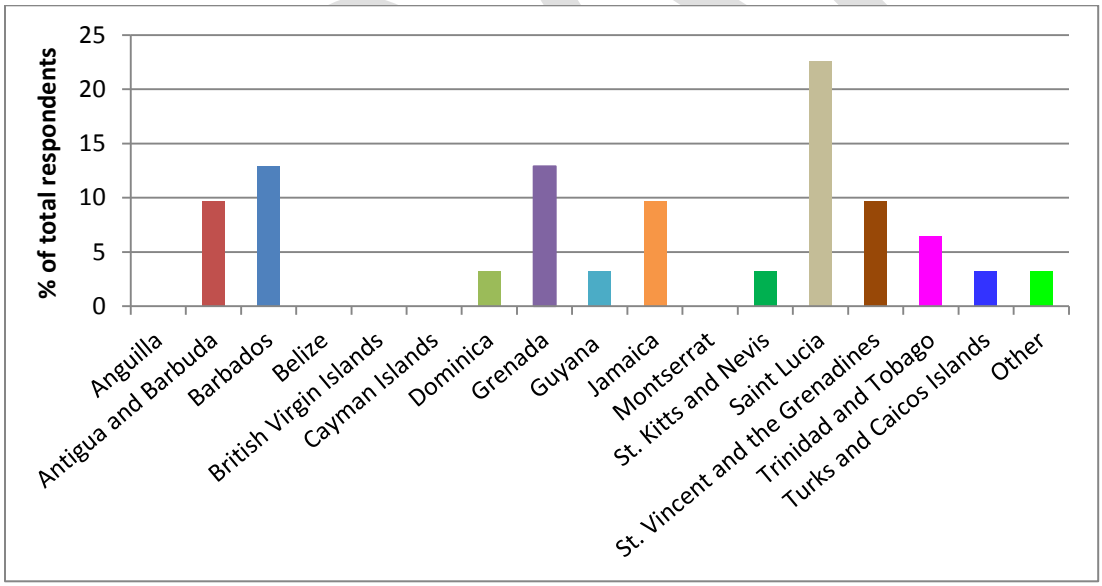

Figure 2. Respondents by Country of Origin

Most respondents were in leadership roles (e.g., Heads of Departments, Chief Executive Officers - 26% and 16% respectively) and technical roles (e.g., technical experts) (23%) (Figure 3).

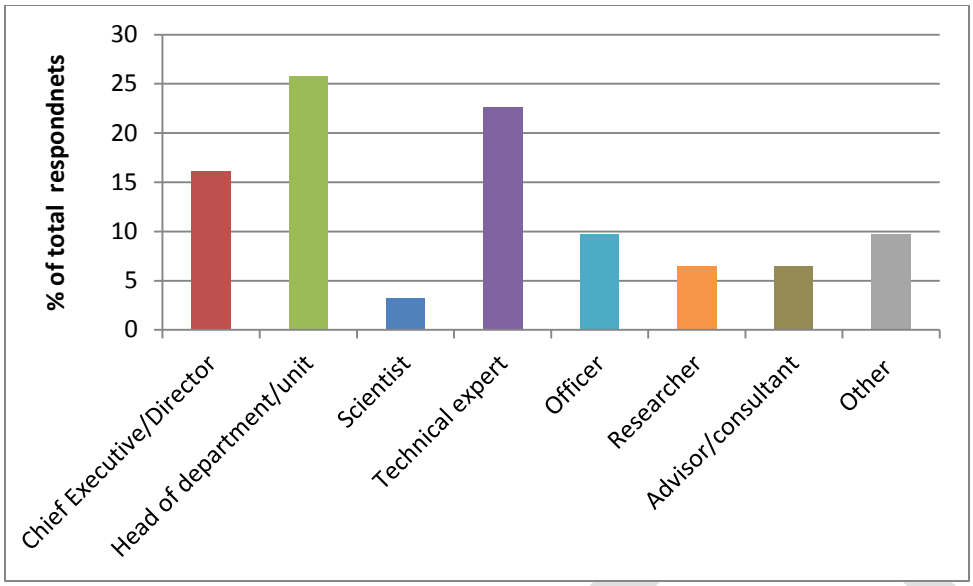

Figure 3. Respondent positions

4.2 Organization profile

Of the total number of respondents, most respondents work at the national level (69%) (Figure 4) in Government agencies or departments (78%) (Figure 5).

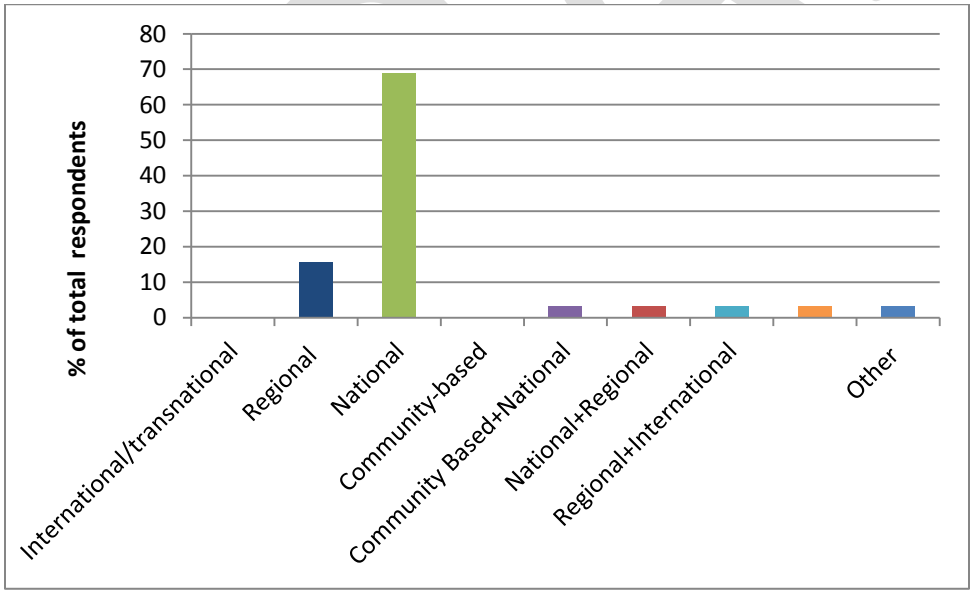

Figure 4. Geographic scope of organizations

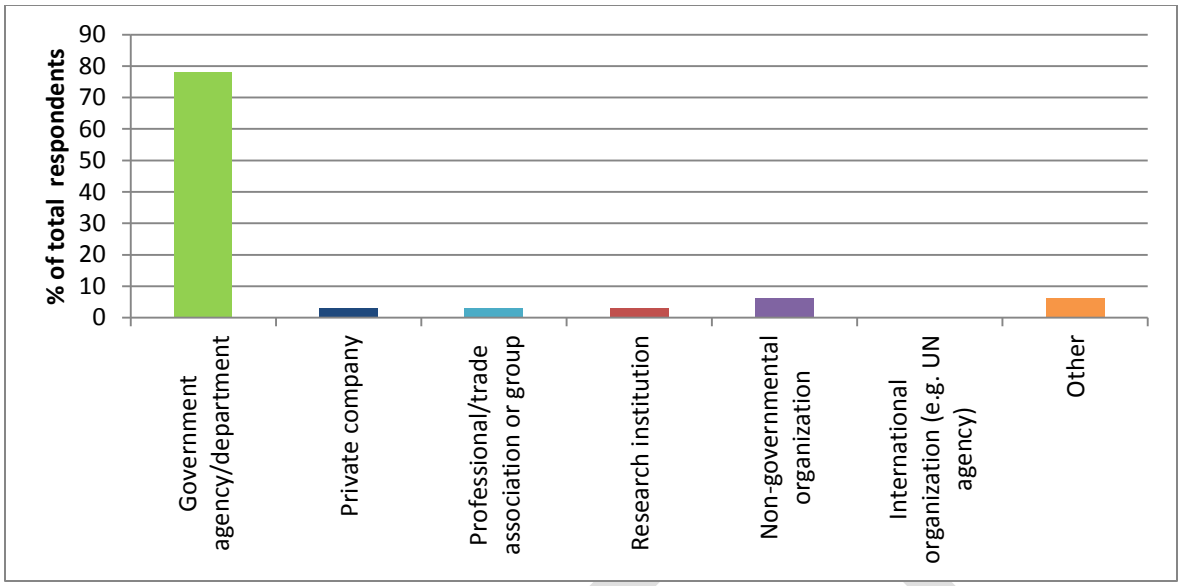

Figure 5. Type of organization

Most respondents use climate information (84%) (Figure 6) but interestingly, many do not work in an organization that has in-house climate expertise (67%). However, just over a quarter of respondents (27%) do (Figure 7).

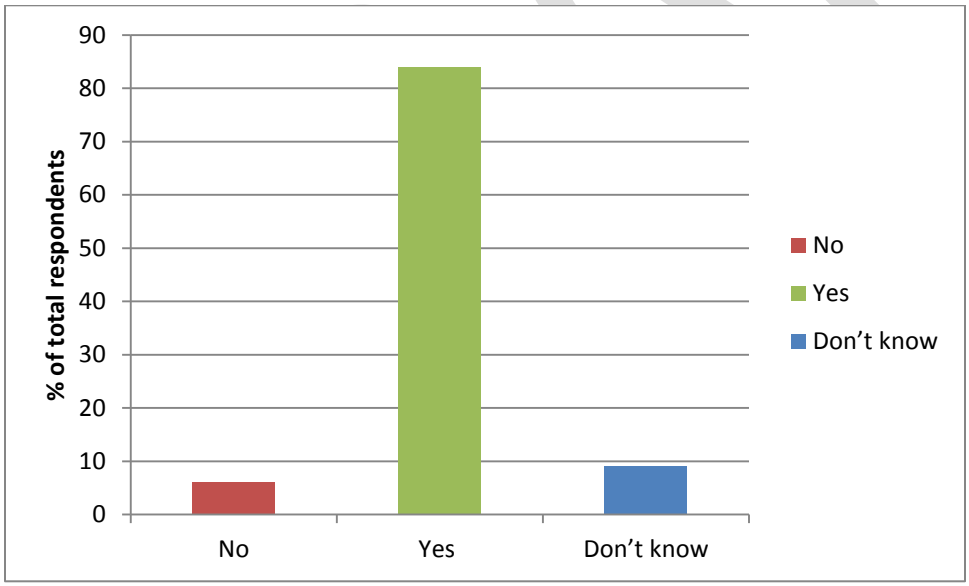

Figure 6. Use of Climate Information in Organizations

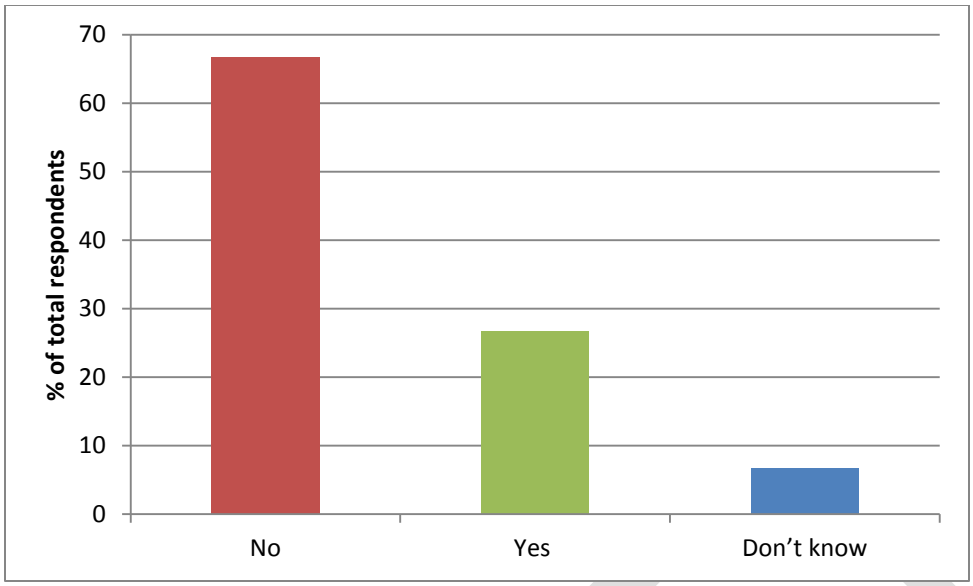

Figure 7. Climate Expertise in Organizations

4.3 Organization decision-making processes

The timescales for planning organizations' activities vary considerably depending on the type of activity (Figure 8). For example, whilst operational and maintenance activities, as well as, activities based on the business plans/strategies of the organization tend to be planned in the very short to short-term (i.e. every day, to every week to every month), activities based on corporate/capital investment generally have a longer planning timescale, with a tendency for these activities to be planned mainly every 1 to 2 years. The planning of the various types of activities investigated tends to decrease substantially after the 1 to 2 year planning mark, suggesting that many of the organizations in this sample do not tend to plan much beyond 2 years.

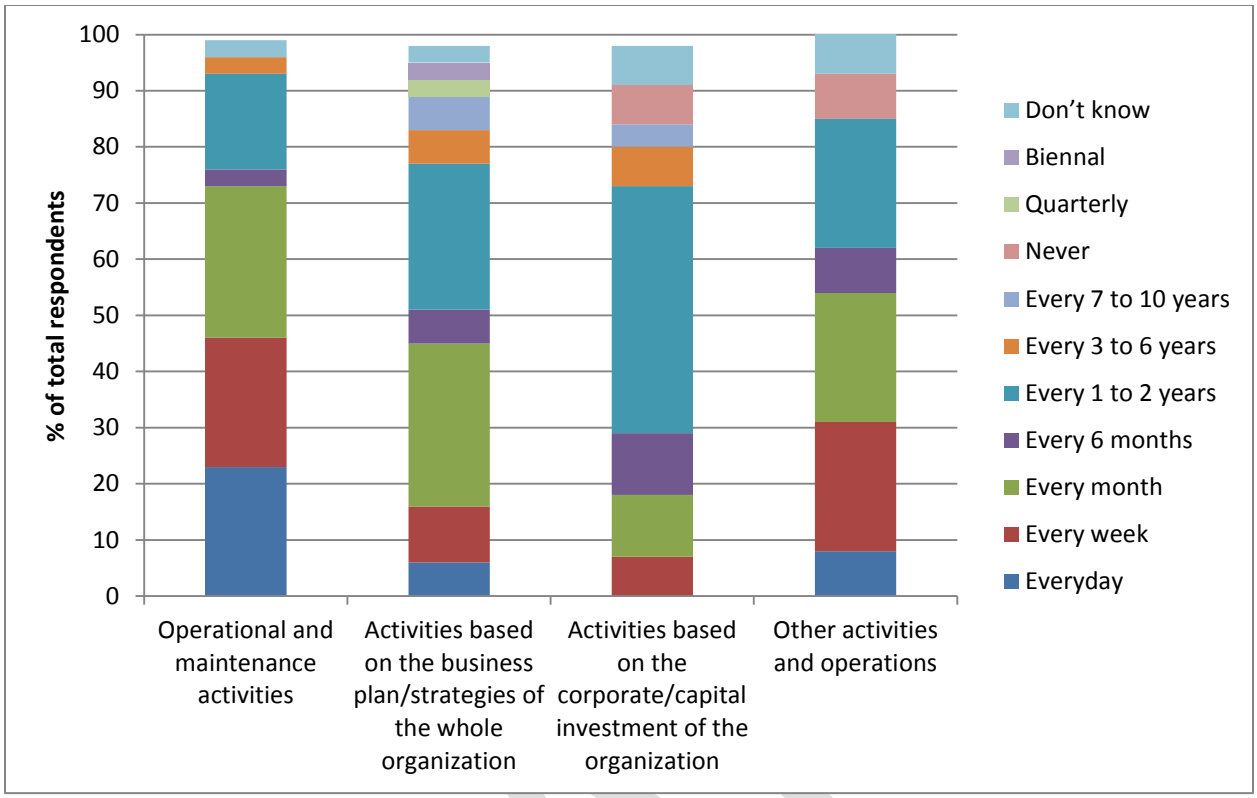

Figure 8. Planning horizons for various types of organizational activities

In terms of decision-making preferences, the large majority of organizations plan for both likely and unlikely climate- and weather- related risks. In addition, the majority of respondents agreed or strongly agreed that their organization would like to receive information in a form that helps them to make the right YES/NO decision (94%). Many also agreed or strongly agreed that their organization plans for climate risks that are most likely to occur (87%) and that time pressures to make decisions is another factor influencing the way that they make decisions (84%). The majority agreed or strongly agreed that they plan for rare but severe weather events (73%). Less prominent factors influencing the way in which these organizations make decisions relates to the need to know what will happen versus what might happen (41% agree and strongly agree), as well as, the need to have clear guidelines on the level of confidence in the information provided in order for them to make a decision (36% agree and strongly agree).

From the above, it is apparent that the largest area of value added in communicating weather and climate information is to provide information in a form that helps decision-makers make the right YES/NO decision. Further research into what 'form' is optimal, is needed. These research results also help us to recognize that situational factors that are extraneous to the value of climate and weather information (e.g., time pressures) influence decision-making.

4.4 Use of weather and climate information

Regarding the various types of information used in the organizations, meteorological data was the most prominent type of data used by respondents everyday (30%) and monthly (37%) respectively. Climate, hydrological, economic, demographic and environmental data tend to be used most often on the monthly timescale, although there is also a fair amount of use of these types of information on the daily and 6 month timescales (Figure 9).

When compared to meteorological data (30%), climate data is used by fewer respondents on a daily basis (18%), as well as, on a monthly basis (32% versus 37%) but this latter difference is marginal. When compared to all other information types, climate data is used by the largest % of respondents on a 6 month basis (21%).

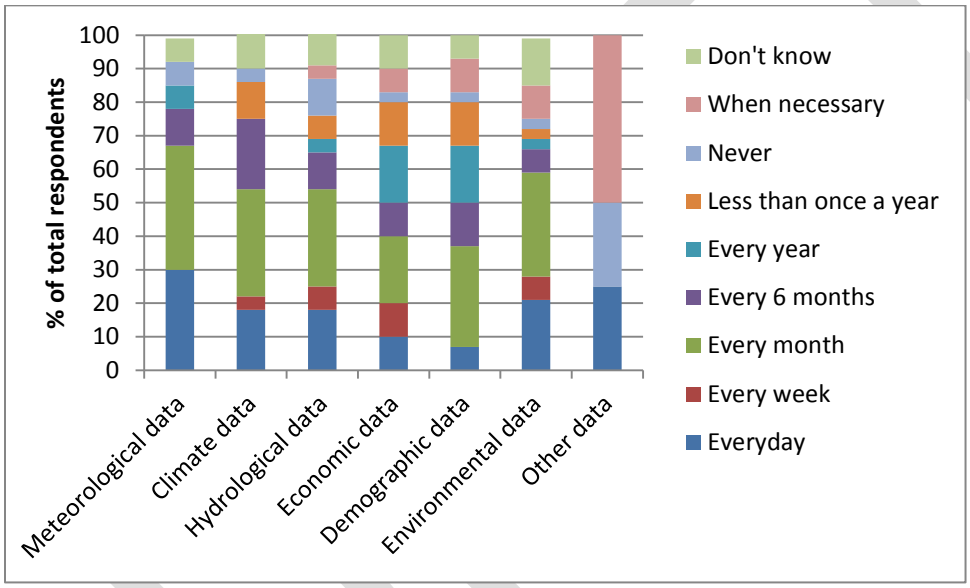

Figure 9. Frequency of use of various types of information

Only a minority of respondents have never used meteorological, climate or hydrological data. The fairly widespread use of meteorological, climatological and hydrological data then, represents an opportunity for climate providers like CIMH and the NMHSs to make impact in certain areas of organizational decision-making. For example, because timescales coincide for the planning of organizational activities and the use of meteorological, climatological and hydrological information, these types of information are likely to be used in operational and maintenance activities, as well as, activities based on the business plans/strategies. There is little evidence for the use of these data types to plan activities based on the corporate, capital investment of organizations. However, this lack of evidence may be an indication of the timescale at which existing climate information is provided (sub-seasonal to seasonal). CIMH may choose to investigate providing climate information on the inter-annual to decadal timescales to address this gap.

The most used weather and climate information in the very short to short-term (everyday to every month) are weather forecasts (Figure 10). Past weather data, past climate data, weather forecasts and seasonal climate forecasts are consistently used by a fair percentage of respondents (22-38%) on the monthly timescale. Respondents tend to use seasonal climate forecasts on the 1 month and 6 month timescale. A fair percentage of respondents have never used Inter-annual climate predictions (21%) nor climate change projections (25%).

The results validate previous results showing that: 1) meteorological data was the most prominent type of data used *everyday* and *monthly* respectively, and 2) climate data was used most often on a monthly timescale (Figure 9). These results add to our general understanding by narrowing the range of meteorological and climate data providers may seek to focus on because of their importance in user-decision-making, and 2) highlighting gaps in the use of certain types of climate data (i.e. inter-annual climate predictions and climate change predictions).

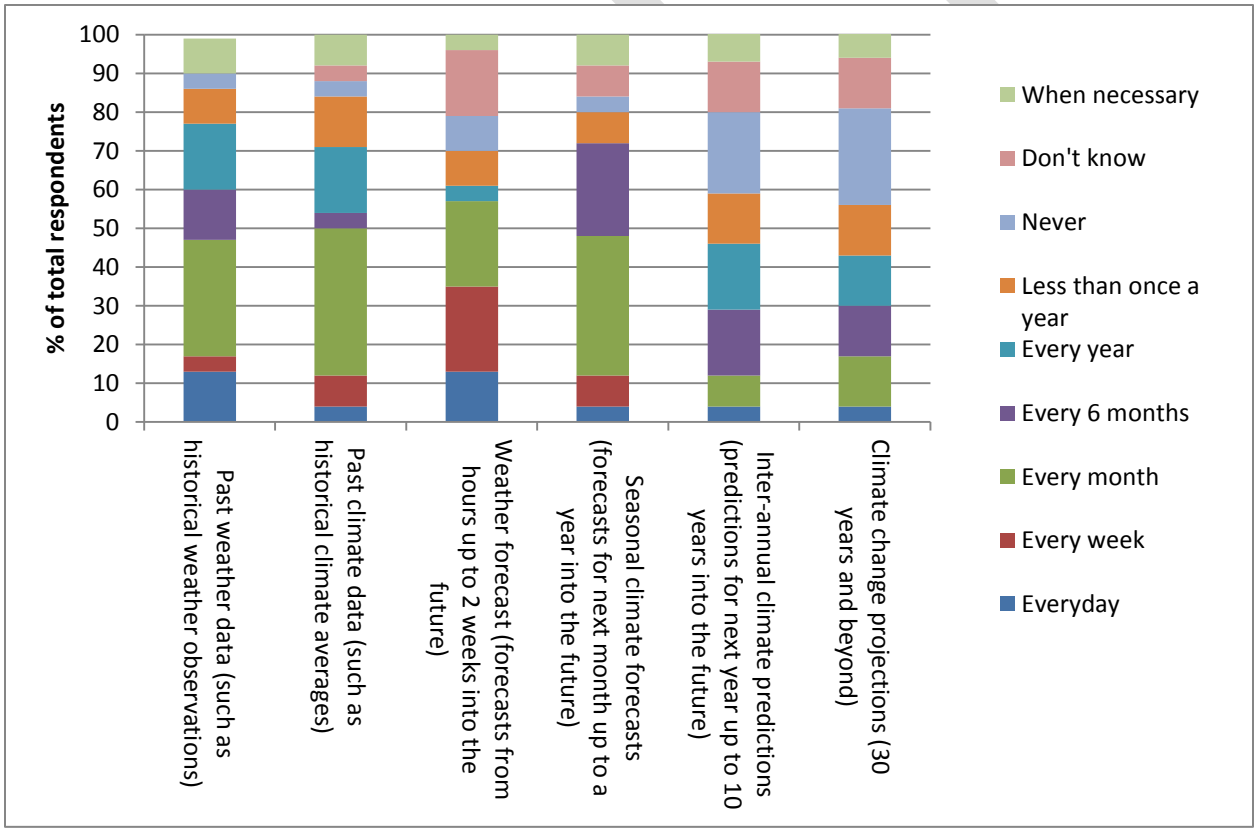

Figure 10. Frequency in using Weather and Climate data in Organizations

In terms of how climate information is used, a large percentage of respondents (58%) use weather forecasts to help inform and manage their day-to-day operational activities (Figure 11). By contrast, climate information is mainly used to inform strategic planning, and to inform and manage day-to-day operational activities. This for example is the main use of seasonal climate

forecasts. The majority of respondents use inter-annual climate predictions (52%), as well as, climate change projections (64%) to inform strategic planning. Past weather data (38%), past climate data (46%) and seasonal climate forecasts (38%) are also used by a significant number of respondents for strategic planning. Very few organisations (< 10% in all cases) use weather and climate information that is analysed outside the organization and then integrated into their organisational models and/or research. However, some organisations (<20% in all cases) do analyse weather and climate information within the organization and then integrate it into their models and/or research.

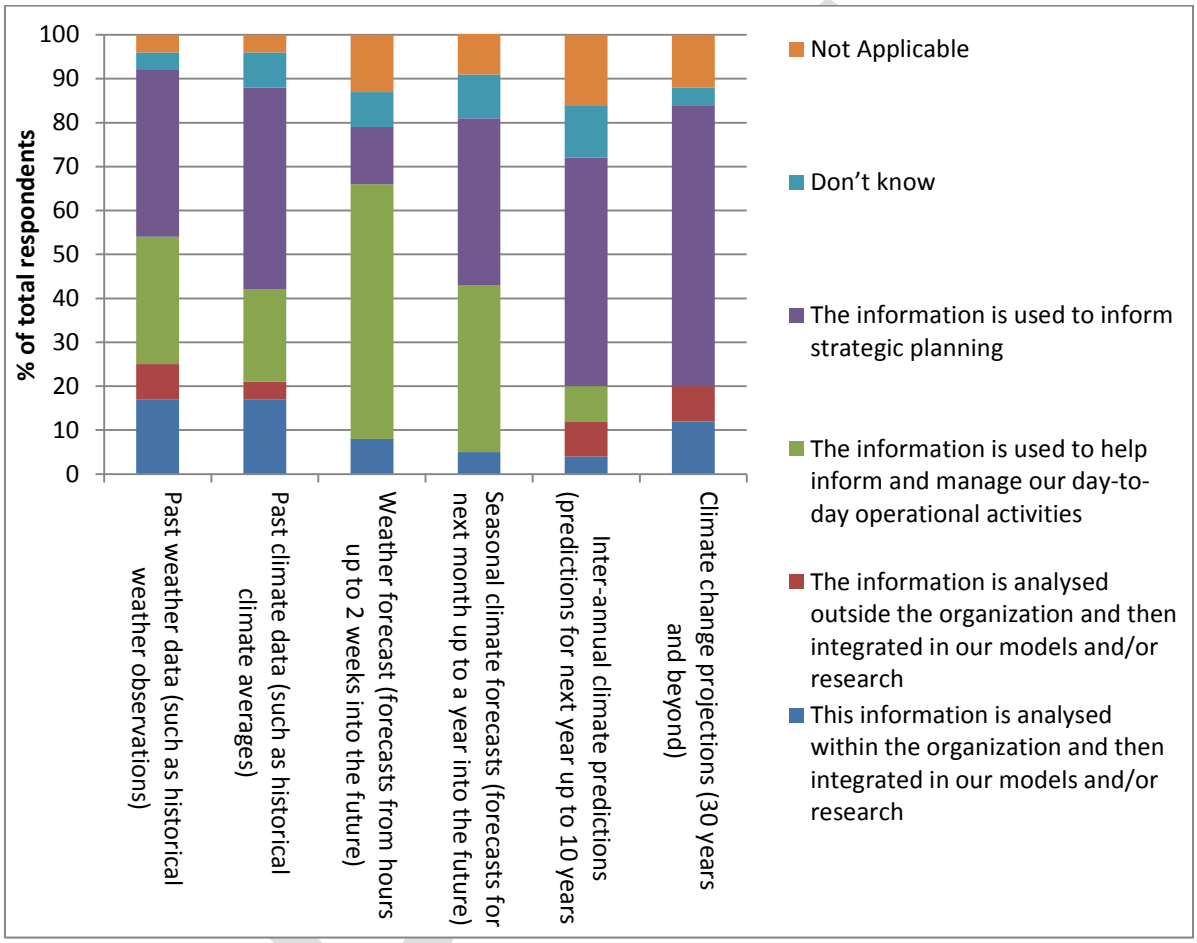

Figure 11. Use of Climate Information

The level of awareness of the suite of current CIMH climate products and tools was fairly high among respondents (Figure 12). For example, between 70% and 86% of respondents are aware of the Caribbean Standardised Precipitation Index (SPI) Outlook, the Caribbean Drought Bulletin, the CariCOF Climate Outlook, the CariCOF Precipitation Outlook, the CariCOF Temperature Outlook, and the CariCOF Drought Outlook. On the other hand, between 50-68% of respondents are not aware of the Regional Agroclimatic Bulletin, the Caribbean Dewetra platform and the Climate Impacts Database. The reasons underpinning this fairly high lack of awareness should be the subject of future research.

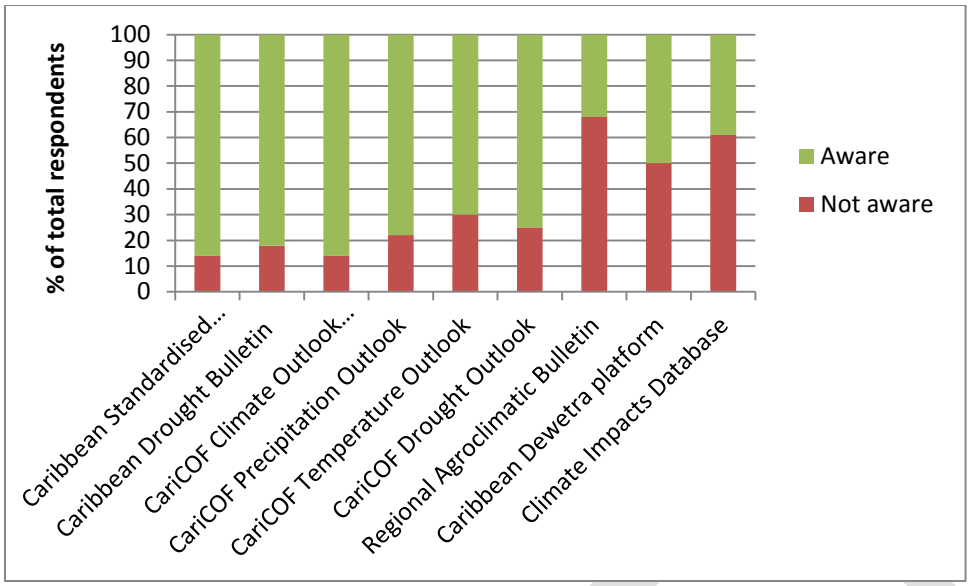

Figure 12. Awareness of CIMH Climate Products and Tools

As Figure 13 shows, respondents rate the usability of the CariCOF Climate Outlook Newsletter (37% as very usable and 59% as usable), the CariCOF Precipitation Outlook (46% as very usable and 50% as usable), the CariCOF Drought Outlook (43% as very usable and 52% as usable), the CariCOF Temperature Outlook (47% as very usable and 47% as usable) the highest, followed by the Caribbean Drought Bulletin (43% as very usable and 46% as usable) and the Caribbean Standardised Precipitation Index (SPI) Outlook (41% as very usable and 33% as usable). Respondents' lack of awareness of the Regional Agroclimatic Bulletin, the Caribbean Dewetra platform and the Climate Impacts Database was reflected in their responses to this question. Between 22% - 36% of respondents responded that they did not know about the usability of these products and tools.

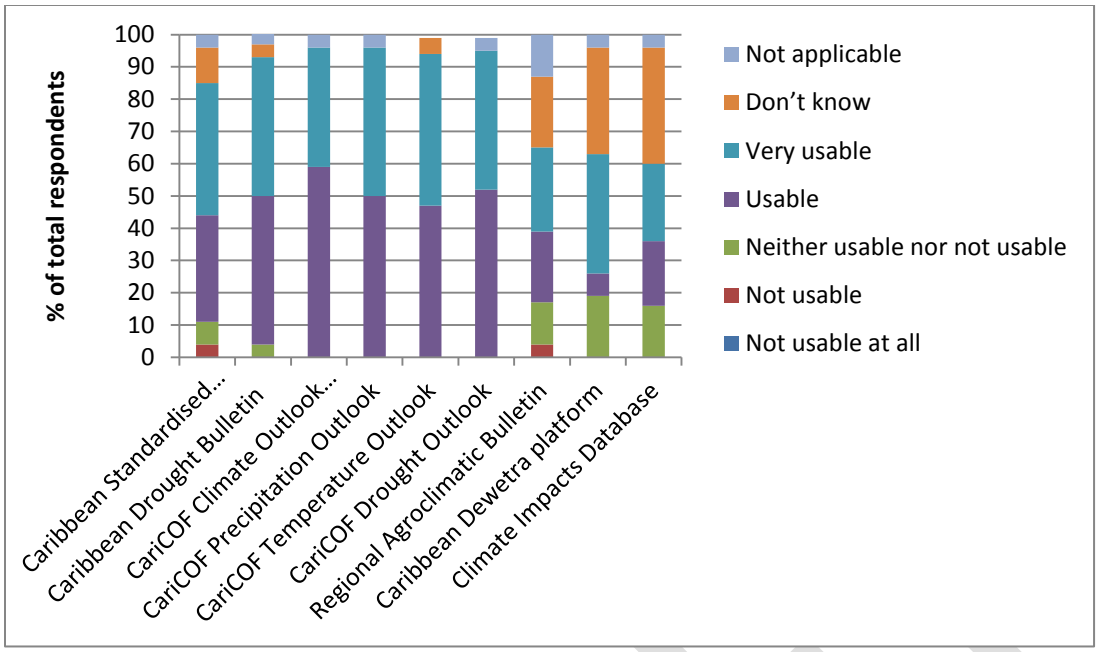

Figure 13. Usability of CIMH Climate Products and Tools

4.5 Sources of weather and climate information

Respondents were asked about the sources of weather and climate information for their organization (Figure 14).

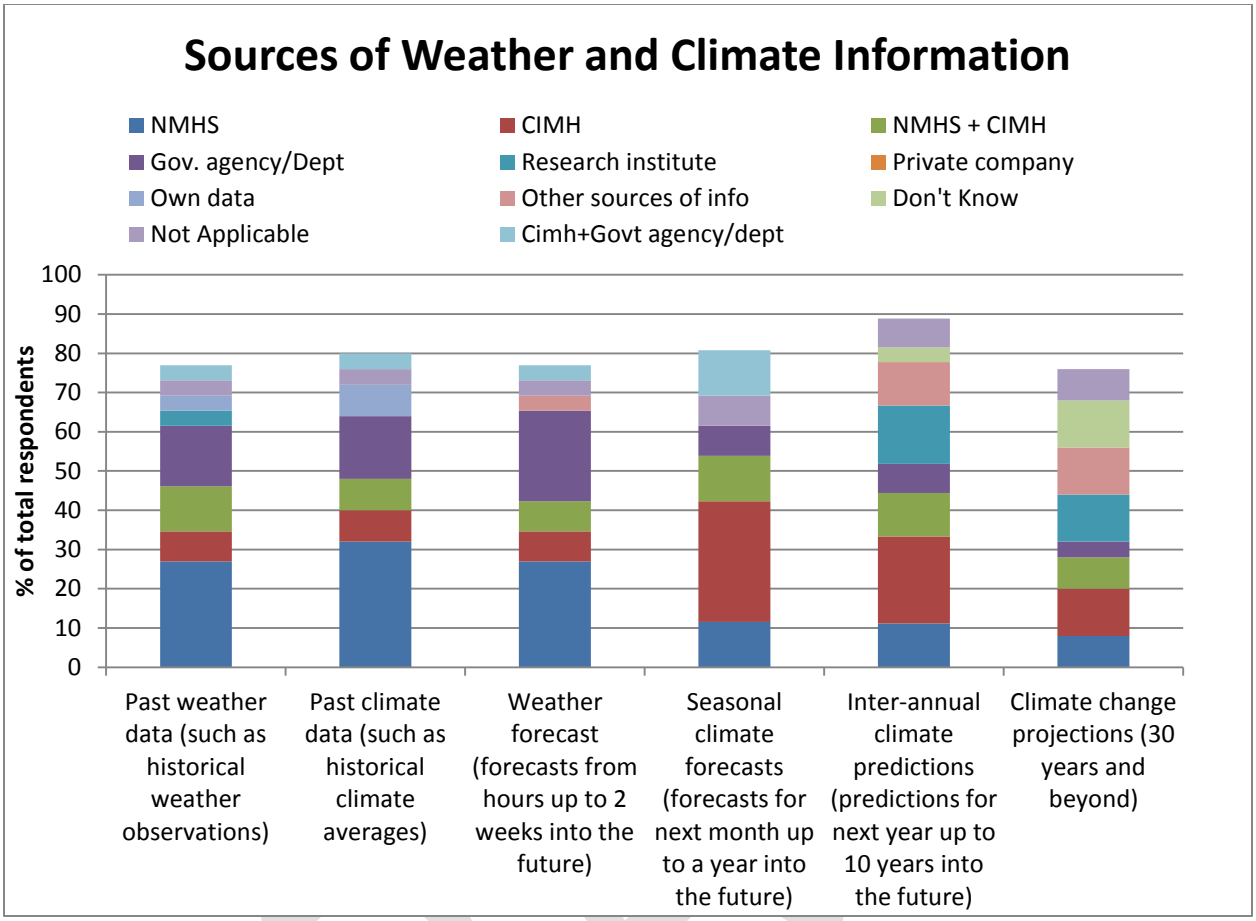

Figure 14. Sources of Weather and Climate Information

25 response categories were recorded for this question (See Appendix B, Table 15). Many response categories represented a combination of sources of weather and climate information (e.g., NMHS + CIMH + own data). The main sources of weather and climate information are the National Meteorological and Hydrological Services, the CIMH and Government agencies/departments. Several respondents also indicated that they source weather and climate information from both the NMHS and CIMH. This result points to the fact that unlike other regions of the world (such as Europe), private companies are yet to make impact as weather and climate information providers in the Caribbean (Dessai and Soares 2015).

In terms of types of weather and climate information sourced from different providers, respondents rely on the NMHS mainly for past climate data (32%), past weather data (27%) and weather forecasts (27%). They rely on the NMHS to a lesser extent for seasonal climate forecasts (12%), inter-annual climate predictions (11%) and climate change projections (8%). The situation is similar for their reliance on a Government agency/department. By contrast, respondents look to CIMH to source seasonal climate forecasts (31%), inter-annual climate predictions (22%) and climate change projections (12%), more so than past climate data (8%), past weather data (8%) and weather forecasts (8%). Although much less prominent, research institutes also play a role, particularly as sources of inter-annual (15%) and climate change

projections (12%). A very small minority of respondents collect/archive their own past weather and climate data.

Climate information providers such as the NMHS, the CIMH, the Caribbean Community Climate Change Centre (CCCCC) and the Climate Studies Group, at the Mona Campus of the University of the West Indies enjoy varying levels of interaction with respondents (Figure 15).

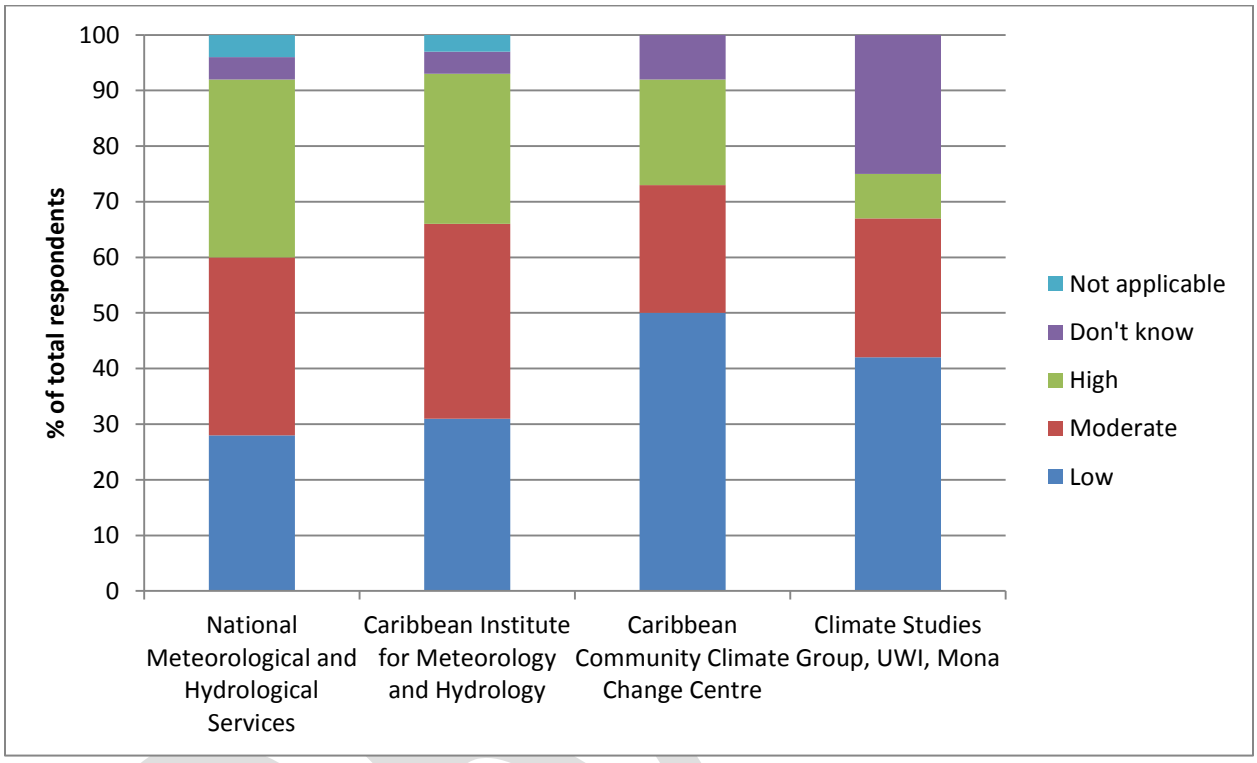

Figure 15. Interaction with Climate Information Providers

This result suggests that oganizations have least interaction with the CCCCC and the most interaction with the NMHS followed by the CIMH. For example, a fair % of respondents describe their interaction with the NMHS as high (32%), moderate (32%) and low (28%). Just under a third of respondents (27%) described their level of interaction with the CIMH as high; 31% describe their interaction with CIMH as low while 35% describe this as moderate (35%). Only 19% of respondents described their relationship with the CCCCC as high; with 23% viewing their interaction as moderate and 50% viewing their interaction as low. 42% of respondents described their interaction with the Climate Studies Group, UWI, Mona as low; with 25% describing their interaction as moderate and 8% as high. Approximately 25% of users seem not to know how to describe their interaction with the CSGM.

As Figure 16 shows, the most prominent barrier to climate information use is the lack of in-house expertise to use this information (62% agree). This points to a need for capacity building among endusers. The next prominent barrier to use is respondents' perceptions that the level

of detail of existing climate information is not appropriate to support organizational decisions (25% agree and 17% strongly agree), while a fair percentage of respondents also think that they do not know what climate information is available (33% agree). Interestingly, approximately 50% of respondents are not of the opinion (33% disagree and 17% strongly agree) that the information available does not suit their needs.

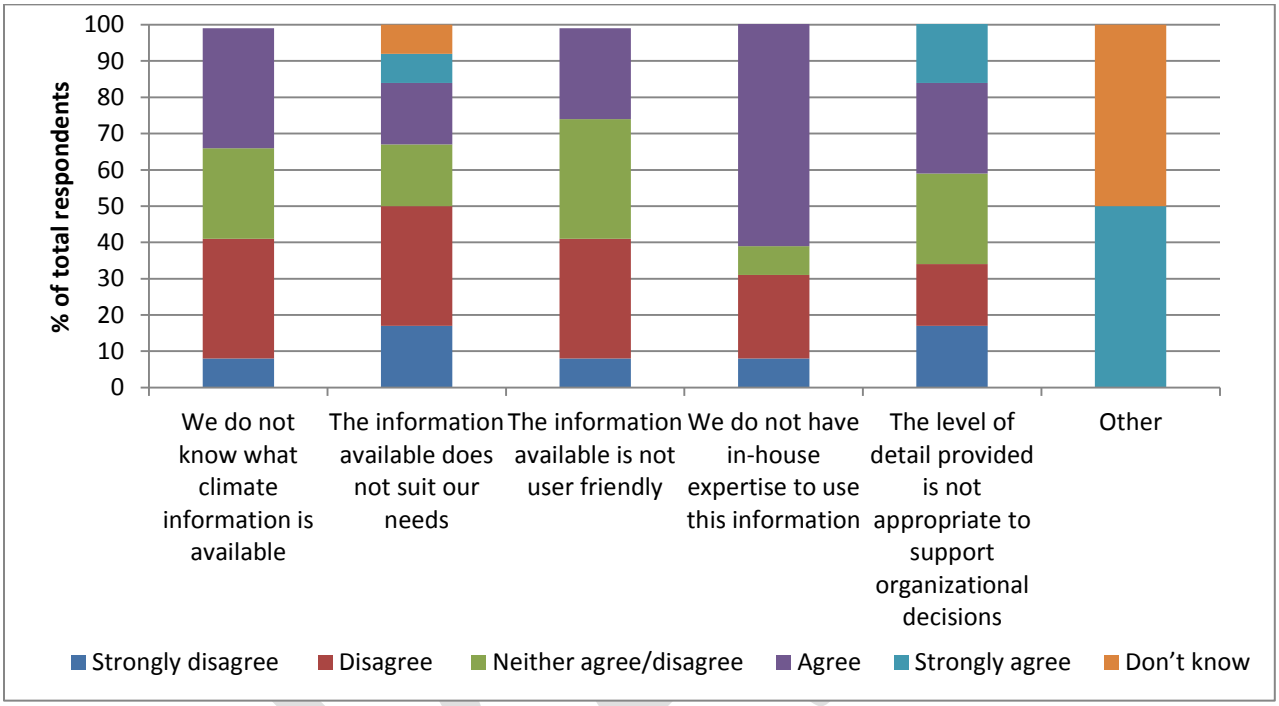

Figure 16. Barriers to climate information use

4.6 Perceptions of CariCOF

One capacity building mechanism in the Caribbean context is the Caribbean Climate Outlook Forum (CariCOF). Given previous results indicating the need to build capacity to use climate information, it is not surprising to find that respondents generally value the CariCOF (Figure 17).

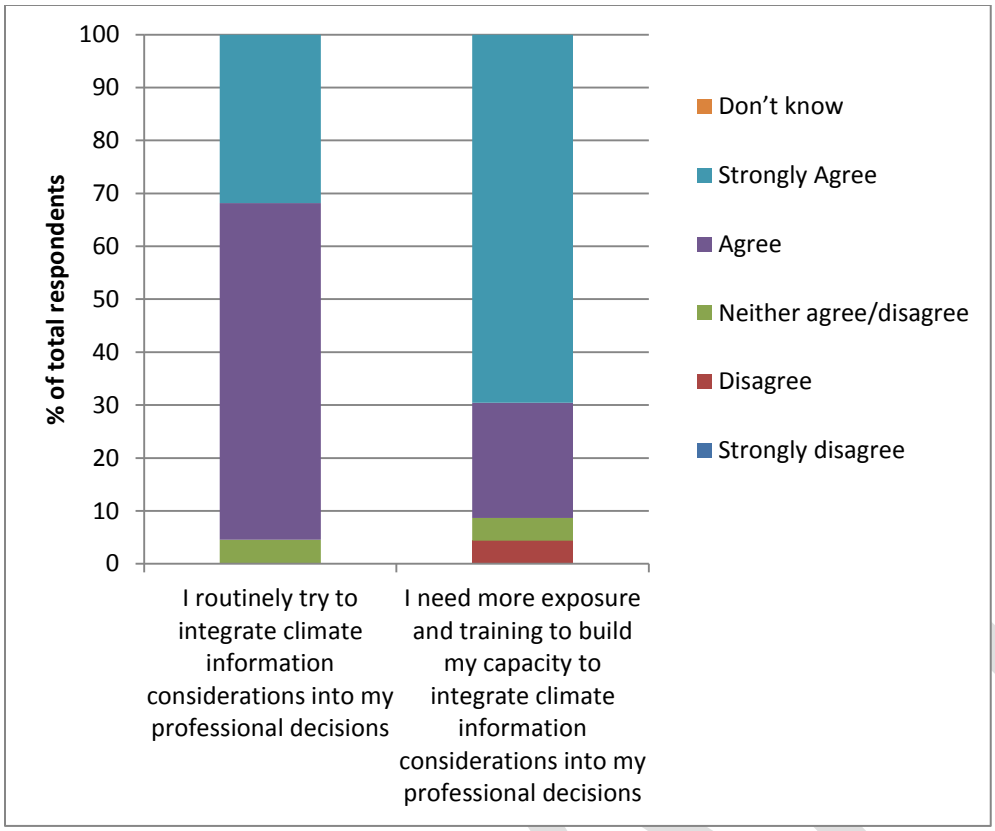

Figure 17. Respondent perceptions of the value of CariCOF

92% agree and strongly agree that they need more exposure and training gained through the CariCOF to build their capacity to integrate climate information considerations into their professional decisions while 96% agree and strongly agree that they routinely try to integrate climate information considerations into their professional decisions. It can be plausibly assumed that the CariCOF builds their capacity to do this.

Respondents were asked to rate the usability of a suite of proposed climate information/products for the Caribbean (Figure 18).

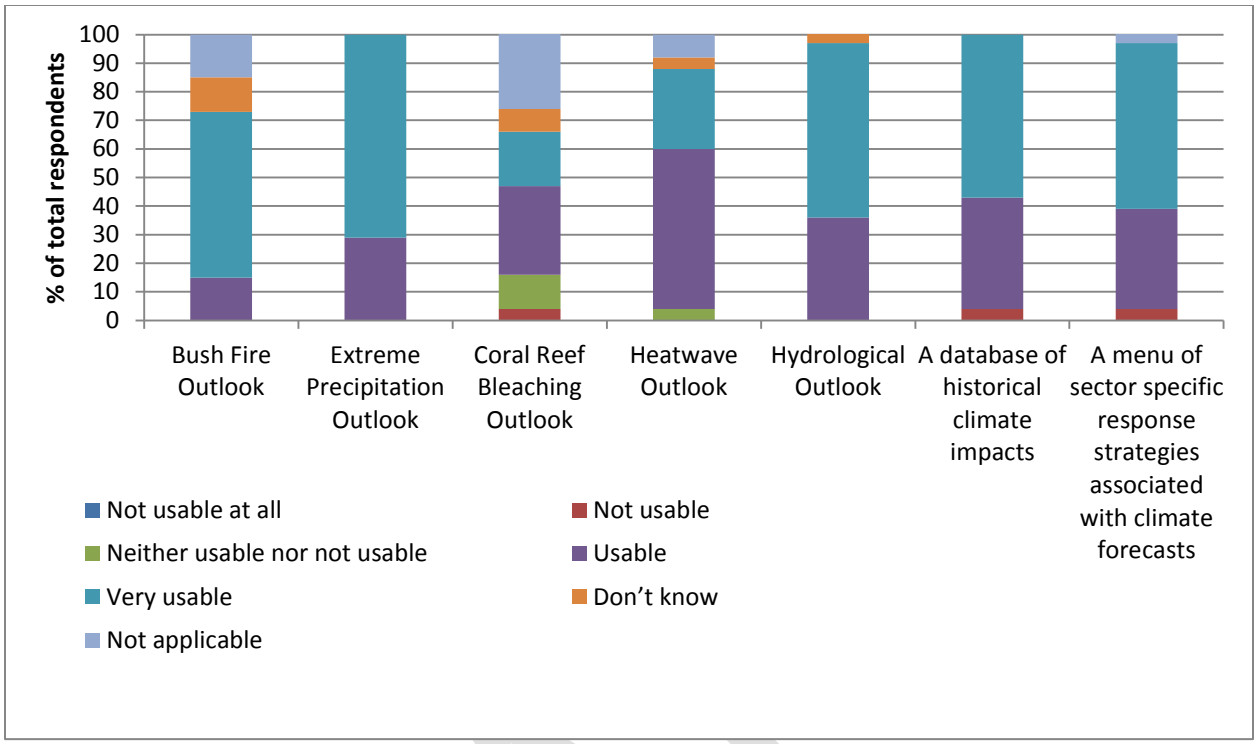

Figure 18. Usability of Proposed CariCOF Climate Information/Products

The proposed Extreme Precipitation Outlook was rated most favorably by respondents on usability (rated by 71% as very usable and 29% as usable), followed by the Hydrological Outlook (61% as very usable and 36% as usable), a database of historical climate impacts (57% as very usable and 39% as usable), a menu of sector specific response strategies associated with climate forecasts (58% as very usable and 35% as usable), a Heatwave Outlook (28% as very usable and 56% as usable), a Bush Fire Outlook (58% as very usable and 15% as usable), and finally, a Coral Reef Bleaching Outlook (19% as very usable and 31% as usable).

Using the above results as a guide to user demand for future climate products and tools, CIMH should continue to develop its Wet Spells/Wet Days Outlooks and the CID. The regional climate information provider should also consider starting work on a Hydrological Outlook and a menu of sector specific response strategies associated with climate forecasts as the survey results point to some demand for this.

4.7 Perceptions of the BRCCC Programme's Proposed Sectoral EWISACTs Outputs

Respondents were asked to rate the usability of proposed outputs under the sectoral EWISACTs component of the BRCCC Programme (see Appendix C). Most proposed outputs under the BRCCC Programme were well received. Overall, the majority of respondents thought that sector specific climate service webpages on the CIMH RCC website (40% view this as useful while 60% view it as very useful); case study briefs demonstrating how existing climate information has improved sectoral decision-making (38% view this as useful while 62% view it as very useful);

sector specific impact models (36% view it as useful and 61% view it as very useful) sector specific sessions at the CariCOF (48% view this as useful while 52% view it as very useful); research on how climate negatively/positively impacts climate-sensitive sectors (31% view this as useful while 66% view it as very useful); an interface tool in the Climate Impacts Database enabling users to correlate forecasts to past impacts and appropriate response strategies (38% view this as useful while 59% view it as very useful); and sector specific Outreach Workshops (39% view this as useful while 61% view it as very useful) were 'Useful' and 'Very Useful'. These outputs were the most favourably viewed of the list of proposed BRCCC Programme outputs for the 2015-2016 period.

Sector specific communication packages of multi-media materials (48% view this as useful while 45% view it as very useful) was next in line in terms of respondents' ratings of usefulness. Even fewer respondents rated baseline information regarding provider capacity to deliver climate services (45% view this as useful while 45% view it as very useful); baseline information regarding user needs for climate services (46% view this as useful while 46% view it as very useful); sector specific climate product prototypes (55% view this as useful while 34% view it as very useful); monthly sectoral EWISACTs bulletins (45% view this as useful while 45% view it as very useful); and the development of a 10 year sectoral EWISACTs Plan of Action (50% view this as useful while 39% view it as very useful) as Useful' and 'Very Useful'.

There was much less support regarding the usefulness of some outputs, namely Caribbean Dewetra training workshops (21% view this as useful while 55% view it as very useful); a Caribbean Dewetra User Toolkit (38% view this as useful while 34% view it as very useful); sector specific climate products integrated into the Caribbean Dewetra platform (39% view this as useful while 32% view it as very useful); and an online Caribbean Dewetra module (32% view this as useful while 39% view it as very useful). This result may be a reflection of the low level of awareness (50% not aware), as well as, of the utility of the Dewetra platform in aiding sectoral decision-making. From a strategic perspective, although not rated highly by users, some of these outputs may still be favourably considered for implementation. For example, it is important to establish a baseline of provider capacity and user needs to be able to monitor and evaluate changes in the climate services agenda over time. Moreover, the use of Decision Support Systems (DSS) to support evidence based decision-making that lead to climate resilience is critical. The Caribbean Dewetra platform represents one such DSS and consideration therefore should be given to investing in the development of learning tools that promote its use.

Respondents are also generally willing to participate in activities implemented under the BRCCC Programme. They are particularly open to participating in future outreach and training workshops as (97%) of respondents indicated yes to participating in future outreach and training workshops while (3%) said maybe they would participate. For taking part in interviews with the research team (89%) said yes they would take part while (11%) said maybe. Eighty three percent (83%) of the respondents indicated that they would participate in the testing of climate product prototypes while (17%) said maybe they would participate. Seventy nine percent (79%) indicated that they would provide sectoral datasets, (14%) said maybe while (7%) indicated that they don't know. None of the respondents indicated that they will not be involved in the BRCCC programme in the future.

4.8 Perceptions of the sustainability of climate services

For the most part, respondents have clear views on the sustainability of climate services. All respondents disagree (38% disagree and 62% strongly disagree) that climate services are of little value in their organization's operations and planning (Figure 19). All respondents (21% agree and 79% strongly agree) are of the opinion that the Caribbean should continue to invest in building its climate services capacity. In addition, they agree (30%) and strongly agree (67%) that a Regional Framework for climate services is desirable and generally believe that their organization is willing to participate in a process to develop a Regional Framework for climate services (38% or respondents agree while 45% of respondents strongly agree). Most respondents think (50% agree and 23% strongly agree) that climate services should be provided free of charge on a regular basis through electronic media. Most respondents also agree (66% agree and 28% strongly agree) that they would like to gather climate information on their own at a user-friendly and easily accessible website. These results suggest that there is strong support for the development of sector specific climate services webpages on the CIMH website.

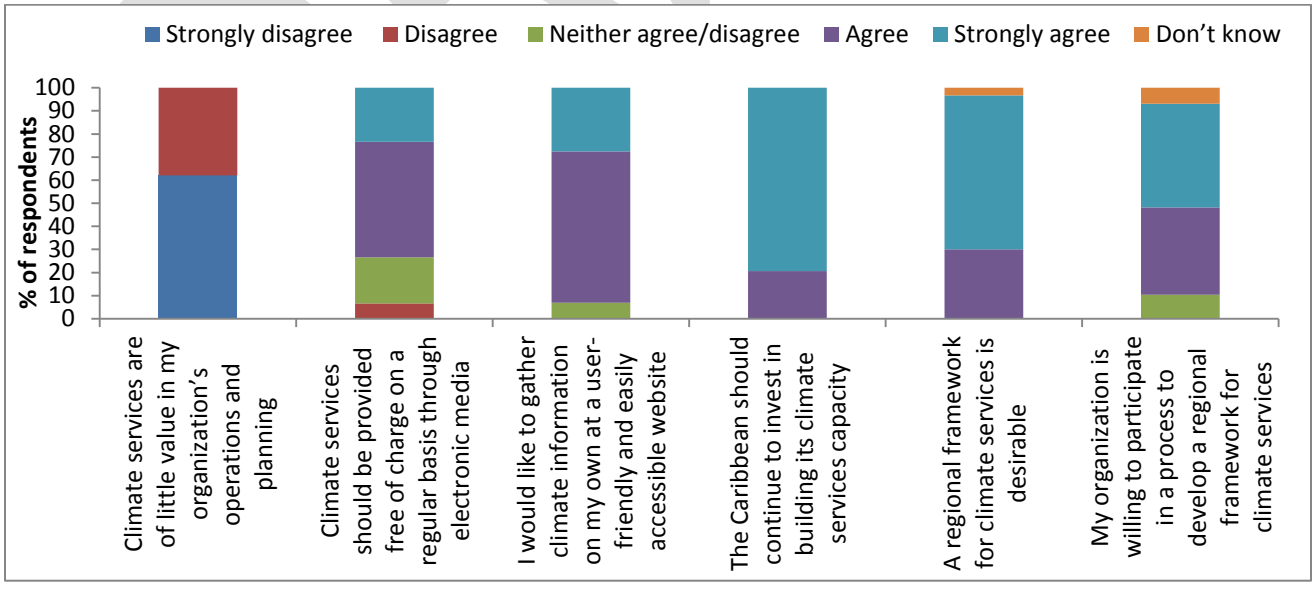

Figure 19. Perception of the sustainability of climate services

5. Limitations

The results of this research are based on a non-random, convenience sample of 32 respondents. The nature and size of the sample therefore limits the interpretations and conclusions that can be made. For example, representatives from the tourism, health and energy sectors are under-represented, as are endusers residing in Anguilla, Belize, the BVI, the Cayman Islands and Montserrat. A larger, more differentiated sample would allow for elucidation of clearer use and decision-making preferences for users in all the sectors under review in a wider range of national contexts. As future similar surveys of users are conducted in the near future, new data should be added to the dataset and the results reanalyzed. The elucidation of user needs through in-depth focus groups and one-on-one interviews should also be pursued as such qualitative data can enhance provider understanding of the contextual dimensions of the design, development and delivery of climate information.

Consideration should also be given to expanding the set of baseline questions to include: 1) end-user general knowledge of the (variability of) climate of the region, 2) decision-makers' perception of climatic risk (with a focus on past and present ENSO events); 3) decision-makers' perception of other forms of risk; 4) impacts of ENSO on end-user productivity; 5) awareness of and attitudes towards climate outlooks; 6) use of climate outlooks to make operational decisions (past and present); 7) perceptions of the usability of climate outlooks (including an assessment of perceptions of perceived impediments of use); 8) in light of past and current El Niño impacts, whether operational decisions were changed considering climate outlooks; 9) which operational decisions were changed considering climate outlooks and in what ways; and 10) perceived changes (positive, negative, no change) in productivity outcomes as a result of the use of climate information.

6. Conclusion

This Report documented the preliminary results of a survey of user needs for climate information using a non-random, convenience sample of 2015 Wet Season CariCOF participants. Results on organizational decision-making processes, and the use of weather and climate information in user decision-making can help climate information providers such as the CIMH, the CCCCC and the CSGM to better understand the enduser context, specifically in terms of what types of decisions are being made, when they are being made and how climate information currently contributes to those decisions. Results on the sources of different types of weather and climate information can help providers to understand their competitive advantage and the specific role that they play in supporting user decision-making. Finally, findings on enduser perceptions of existing and proposed future climate products can be used as a basis for provider prioritization regarding investment into existing products, new products and enduser capacity building.

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APPENDICES

APPENDIX A: Caribbean Climate Services User Survey Questionnaire

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

1. Name of your organization: _____
2. In which country is your organization located? Please tick one.

□ Anguilla
□ Antigua and Barbuda
□ Barbados
□ Belize
□ British Virgin Islands
□ Cayman Islands
□ Dominica
□ Grenada
□ Guyana
□ Jamaica
□ Montserrat
□ St. Kitts and Nevis
□ Saint Lucia
□ St. Vincent and the Grenadines
□ Trinidad and Tobago
□ Turks and Caicos Islands
□ Other (please specify) _____

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

□ Agriculture
□ Water
□ Health
□ Disaster risk management
□ Tourism
□ Energy
□ Other (please specify) _____

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

□ International/transnational
□ Regional
□ National
□ Community-based
□ Other (please specify) _____

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

□ Government agency/department
□ Private company
□ Professional/trade association or group
□ Research institution
□ Non-governmental organization
□ International organization (e.g. UN agency)
□ Other (please specify) _____

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

□ Yes
□ No
□ Don't know

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

□ Chief Executive/Director	□ Head of department/unit
□ Scientist	□ Technical expert
□ Officer	□ Researcher
□ Advisor/consultant	□ Other (please specify) _____

8. 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.

□ Yes □ No

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 agree	Agree	Neither agree/ disagree	Disagree	Strongly disagree	Don't know
I routinely try to integrate climate information considerations into my professional decisions	☐	☐	☐	☐	☐	☐
I need more exposure and training to build my capacity to integrate climate information considerations into my professional decisions	☐	☐	☐	☐	☐	☐

Section B: Decision-making processes in your organization

9. 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 2 to 5 years	Every 5 to 10 years	Never	Don't know
Operational and maintenance activities	☐	☐	☐	☐	☐	☐	☐	☐	☐
Activities based on the business plan/strategies of the whole organization	☐	☐	☐	☐	☐	☐	☐	☐	☐
Activities based on the corporate/capital	☐	☐	☐	☐	☐	☐	☐	☐	☐

investment of the organization									
Other activities and operations (please specify)	☐	☐	☐	☐	☐	☐	☐	☐	☐

10. 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	☐	☐	☐	☐	☐	☐	☐	☐
Climate data	☐	☐	☐	☐	☐	☐	☐	☐
Hydrological data	☐	☐	☐	☐	☐	☐	☐	☐
Economic data	☐	☐	☐	☐	☐	☐	☐	☐
Demographic data	☐	☐	☐	☐	☐	☐	☐	☐
Environmental data	☐	☐	☐	☐	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐	☐	☐	☐	☐

11. 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
My organization plans for rare but severe weather events	☐	☐	☐	☐	☐	☐
My organization plans for those climate risks that are most likely to occur	☐	☐	☐	☐	☐	☐
My organization has clear guidelines on how much confidence in the climate information is required before we take action	☐	☐	☐	☐	☐	☐
Time pressure means that sometimes we have to make decisions before we have as much information as we would like	☐	☐	☐	☐	☐	☐
What we really need is what will happen, not what might happen	☐	☐	☐	☐	☐	☐
We like to receive information in a form that helps us to make the right YES/NO decision	☐	☐	☐	☐	☐	☐

Section C: Use of weather and climate information

12. Are your organization's activities sensitive (either positively or negatively) to any of the following weather and climate-related events and impacts? Please tick the relevant boxes.

	Very positively sensitive	Positively sensitive	Neither positively nor negatively sensitive	Negatively sensitive	Very negatively sensitive	Don't know	Not applicable
Above average temperatures	☐	☐	☐	☐	☐	☐	☐

	Very positively sensitive	Positively sensitive	Neither positively nor negatively sensitive	Negatively sensitive	Very negatively sensitive	Don't know	Not applicable
Below average temperatures	☐	☐	☐	☐	☐	☐	☐
Above average rainfall	☐	☐	☐	☐	☐	☐	☐
Below average rainfall	☐	☐	☐	☐	☐	☐	☐
Above average wind	☐	☐	☐	☐	☐	☐	☐
Below average wind	☐	☐	☐	☐	☐	☐	☐
Severe weather systems	☐	☐	☐	☐	☐	☐	☐
Storm surge	☐	☐	☐	☐	☐	☐	☐
Lightning	☐	☐	☐	☐	☐	☐	☐
Drought	☐	☐	☐	☐	☐	☐	☐
Floods	☐	☐	☐	☐	☐	☐	☐
Landslides	☐	☐	☐	☐	☐	☐	☐
Bush fires	☐	☐	☐	☐	☐	☐	☐
Coastal erosion	☐	☐	☐	☐	☐	☐	☐

13. Please specify other weather and climate-related events and impacts your organization is sensitive to:

_____
_____
_____

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

□ Yes □ No
□ Don't know

If Yes, go to question 15. If No, go to question 23.

15. 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)	☐	☐	☐	☐	☐	☐	☐	☐
Past climate data (such as historical climate averages)	☐	☐	☐	☐	☐	☐	☐	☐
Weather forecast (forecasts from hours up to 2 weeks into the future)	☐	☐	☐	☐	☐	☐	☐	☐
Seasonal climate forecasts (forecasts for next month up to a year into the future)	☐	☐	☐	☐	☐	☐	☐	☐
Inter-annual climate predictions (predictions for next year up to 10 years into the future)	☐	☐	☐	☐	☐	☐	☐	☐

Climate change projections (30 years and beyond)	☐	☐	☐	☐	☐	☐	☐	☐

16. 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)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Past climate data (such as historical climate averages)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Weather forecast (forecasts from hours up to 2 weeks into the future)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Seasonal climate forecasts (forecasts for next month up to a year into the future)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Inter-annual climate predictions (predictions for next year up to 10 years into the future)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Climate change projections (30 years and beyond)	☐	☐	☐	☐	☐	☐	☐	☐	☐

Note: NMHS = National Meteorological and Hydrological Service

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

_____
_____
_____

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

	High	Moderate	Low	Don't know	Not applicable
National Meteorological and Hydrological Services	☐	☐	☐	☐	☐
Caribbean Institute for Meteorology and Hydrology	☐	☐	☐	☐	☐
Caribbean Community Climate Change Centre	☐	☐	☐	☐	☐
Climate Studies Group, UWI, Mona	☐	☐	☐	☐	☐

19. 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)	☐	☐	☐	☐	☐	☐
Past climate data (such as historical climate averages)	☐	☐	☐	☐	☐	☐
Weather forecast (forecasts from hours up to 2 weeks into the future)	☐	☐	☐	☐	☐	☐
Seasonal climate forecasts (forecasts for next month up to a year into the future)	☐	☐	☐	☐	☐	☐
Inter-annual climate predictions (predictions for next year up to 10 years into the future)	☐	☐	☐	☐	☐	☐
Climate change projections (30 years and beyond)	☐	☐	☐	☐	☐	☐

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

_____
_____
_____

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

	Very usable	Usable	Neither usable nor not usable	Not usable	Not usable at all	Don't know	Not applicable
Bush fire outlook	☐	☐	☐	☐	☐	☐	☐
Extreme precipitation outlook	☐	☐	☐	☐	☐	☐	☐
Coral reef bleaching outlook	☐	☐	☐	☐	☐	☐	☐
Heatwave outlook	☐	☐	☐	☐	☐	☐	☐
Hydrological outlook	☐	☐	☐	☐	☐	☐	☐
A database of historical climate impacts	☐	☐	☐	☐	☐	☐	☐
A menu of sector specific response strategies associated with climate forecasts	☐	☐	☐	☐	☐	☐	☐

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

_____
_____
_____

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

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

	Aware	Not aware
Caribbean Standardised Precipitation Index (SPI) Outlook	☐	☐
Caribbean Drought Bulletin	☐	☐
CariCOF Caribbean Climate Outlook Newsletter	☐	☐
CariCOF Precipitation Outlook	☐	☐
CariCOF Temperature Outlook	☐	☐
CariCOF Drought Outlook	☐	☐
Regional Agroclimatic Bulletin	☐	☐
Caribbean Dewetra platform	☐	☐
Climate Impacts Database	☐	☐

25. 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:

	Very usable	Usable	Neither usable nor not usable	Not usable	Not usable at all	Don't know	Not applicable
Caribbean Standardised Precipitation Index (SPI) Outlook	☐	☐	☐	☐	☐	☐	☐
Caribbean Drought Bulletin	☐	☐	☐	☐	☐	☐	☐
CariCOF Caribbean Climate Outlook Newsletter	☐	☐	☐	☐	☐	☐	☐
CariCOF Precipitation Outlook	☐	☐	☐	☐	☐	☐	☐
CariCOF Temperature Outlook							

	Very usable	Usable	Neither usable nor not usable	Not usable	Not usable at all	Don't know	Not applicable
CariCOF Drought Outlook	☐	☐	☐	☐	☐	☐	☐
Regional Agroclimatic Bulletin	☐	☐	☐	☐	☐	☐	☐
Caribbean Dewetra platform	☐	☐	☐	☐	☐	☐	☐
Climate Impacts Database	☐	☐	☐	☐	☐	☐	☐

Section D: Sustainability

26. Please rate the usefulness of the following proposed outputs of the BRCCC Programme to the long-term advancement of climate early warning information in your sector 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	☐	☐	☐	☐	☐	☐	☐
Sector specific communication packages of multi-media materials	☐	☐	☐	☐	☐	☐	☐
Sector specific sessions at the CariCOF 2015-2016	☐	☐	☐	☐	☐	☐	☐
Sector specific impact models	☐	☐	☐	☐	☐	☐	☐
Caribbean Dewetra User Toolkit	☐	☐	☐	☐	☐	☐	☐
Online Caribbean Dewetra module	☐	☐	☐	☐	☐	☐	☐
Caribbean Dewetra training workshops	☐	☐	☐	☐	☐	☐	☐
Sector specific Outreach Workshops	☐	☐	☐	☐	☐	☐	☐
Baseline information regarding user needs for climate services	☐	☐	☐	☐	☐	☐	☐
Baseline information regarding provider capacity to deliver climate services	☐	☐	☐	☐	☐	☐	☐
Development of a 10 year sectoral EWISACTs Plan of Action	☐	☐	☐	☐	☐	☐	☐
Research on how climate negatively/positively impacts climate-sensitive sectors	☐	☐	☐	☐	☐	☐	☐
Interface tool in the Climate Impacts Database enabling users to correlate forecasts to past impacts and appropriate response strategies	☐	☐	☐	☐	☐	☐	☐
Sector specific climate product prototypes	☐	☐	☐	☐	☐	☐	☐
Sector specific climate products integrated into the Caribbean Dewetra platform	☐	☐	☐	☐	☐	☐	☐
Case studies demonstrating how existing climate information has improved sectoral decision-making	☐	☐	☐	☐	☐	☐	☐
Monthly sectoral EWISACTs bulletins	☐	☐	☐	☐	☐	☐	☐

27. 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 in my organization's operations and planning	☐	☐	☐	☐	☐	☐
Climate services should be provided free of charge on a regular basis through electronic media	☐	☐	☐	☐	☐	☐
I would like to gather climate information on my own at a user-friendly and easily accessible website	☐	☐	☐	☐	☐	☐
The Caribbean should continue to invest in building its climate services capacity	☐	☐	☐	☐	☐	☐
A regional framework for climate services is desirable	☐	☐	☐	☐	☐	☐
My organization is willing to participate in a process to develop a regional framework for climate services	☐	☐	☐	☐	☐	☐

28. What level of involvement would you/your organization 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	☐	☐	☐	☐
Take part in interviews with the research team	☐	☐	☐	☐
Participate in the testing of climate product prototypes	☐	☐	☐	☐
Provision of sectoral datasets	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐

29. If there is anything about the development of sectoral EWISACTs 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 B: Data Tables

Table 1. Sectors represented at the 2015 Wet Season CariCOF

Sector representation	n	% of total respondents
Agriculture	8	26
Water	10	32
DRM	7	23
Tourism	1	3
Other	5	16
Health	0	0
Energy	0	0
Total	**31**	**100**

Table 2. Countries represented at the 2015 Wet Season CariCOF

Countries	n	% of total respondents
Anguilla	0	0
Antigua and Barbuda	3	10
Barbados	4	13
Belize	0	0
British Virgin Islands	0	0
Cayman Islands	0	0
Dominica	1	3
Grenada	4	13
Guyana	1	3
Jamaica	3	10
Montserrat	0	0
St. Kitts and Nevis	1	3

Countries	n	% of total respondents
Saint Lucia	7	23
St. Vincent and the Grenadines	3	10
Trinidad and Tobago	2	6
Turks and Caicos Islands	1	3
Other	1	3
Total	**31**	**100**

Table 3. Respondent positions

Position	n	% of total respondents
Chief Executive/Director	5	16
Head of department/unit	8	26
Scientist	1	3
Technical expert	7	23
Officer	3	10
Researcher	2	6
Advisor/consultant	2	6
Other	3	10
Total Answered	**31**	**100**

Table 4. Geographic scope of organizations

Organizational Scope	n	% of total respondents
International/transnational	0	0
Regional	5	16
National	22	69
Community-based	0	0
Community Based+National	1	3
National+Regional	1	3
Regional+International	1	3
National+Regional+international	1	3
Other	1	3
Total	**32**	**100**

Table 5. Type of organization

Classification	n	% of total respondents
Government agency/department	25	78
Private company	1	3
Professional/trade association or group	1	3
Research institution	1	3
Non-governmental organization	2	6
International organization (e.g. UN agency)	0	0
Other	2	6
Total	**32**	**100**

Table 6. Use of Climate Information in Organizations

	n	% of total respondents
No	2	6
Yes	27	84
Don't know	3	9
Total	**32**	**100**

Table 7. Climate Expertise in Organizations

Climate Expertise	n	% of total respondents
No	20	67
Yes	8	27
Don't know	2	7
Total	**30**	**100**

Table 8. Planning horizons for various types of organizational activities

	Operational and maintenance activities		Activities based on the business plan/strategies of the whole organization		Activities based on the corporate/capital investment of the organization		Other activities and operations	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
Everyday	7	23	2	6	0	0	1	8
Every week	7	23	3	10	2	7	3	23
Every month	8	27	9	29	3	11	3	23
Every 6 months	1	3	2	6	3	11	1	8
Every 1 to 2 years	5	17	8	26	12	44	3	23
Every 3 to 6 years	1	3	2	6	2	7	0	0
Every 7 to 10 years	0	0	2	6	1	4	0	0
Never	0	0	0	0	2	7	1	8
Quarterly	0	0	1	3	0	0	0	0
Biennal	0	0	1	3	0	0	0	0
Don’t know	1	3	1	3	2	7	1	8
Total	**30**	**100**	**31**	**100**	**27**	**100**	**13**	**100**

Table 9. Organization's decision making preferences

	My organization plans for rare but severe weather events		My organization plans for those climate risks that are most likely to occur		My organization has clear guidelines on how much confidence in the climate information is required before we take action		Time pressure means that sometimes we have to make decisions before we have as much information as we would like		What we really need is what will happen, not what might happen		We like to receive information in a form that helps us to make the right YES/NO decision	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
Strongly disagree	0	0	0	0	1	3	1	3	2	7	0	0
Disagree	6	20	2	6	8	27	1	3	8	28	0	0
Neither agree/disagree	2	7	2	6	6	20	3	10	6	21	2	6
Agree	12	40	17	55	7	23	20	67	5	17	8	26
Strongly Agree	10	33	10	32	4	13	5	17	7	24	21	68
Don't know	0	0	0	0	4	13	0	0	1	3	0	0
Total	30	100	31	100	30	100	30	100	29	100	31	100

Table 10. Frequency of use of various types of information

	Meteorological data		Climate data		Hydrological data		Economic data		Demographic data		Environmental data		Other	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
Everyday	8	30	5	18	5	18	3	10	2	7	6	21	1	25
Every week	0	0	1	4	2	7	3	10	0	0	2	7	0	0
Every month	10	37	9	32	8	29	6	20	9	30	9	31	0	0
Every 6 months	3	11	6	21	3	11	3	10	4	13	2	7	0	0
Every year	2	7	0	0	1	4	5	17	5	17	1	3	0	0
Less than once a year	0	0	3	11	2	7	4	13	4	13	1	3	0	0
Never	2	7	1	4	3	11	1	3	1	3	1	3	1	25
When necessary	0	0	0	0	1	4	2	7	3	10	3	10	2	50
Don't know	2	7	3	11	3	11	3	10	2	7	4	14	0	0
Total	**27**	**100**	**28**	**100**	**28**	**100**	**30**	**100**	**30**	**100**	**29**	**100**	**4**	**100**

Table 11. Frequency in using Weather and Climate data in Organizations

	Past weather data (such as historical weather observations)		Past climate data (such as historical climate averages)		Weather forecast (forecasts from hours up to 2 weeks into the future)		Seasonal climate forecasts (forecasts for next month up to a year into the future)		Inter-annual climate predictions (predictions for next year up to 10 years into the future)		Climate change projections (30 years and beyond)	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
Everyday	3	13	1	4	3	13	1	4	1	4	1	4
Every week	1	4	2	8	5	22	2	8	0	0	0	0
Every month	7	30	9	38	5	22	9	36	2	8	3	13
Every 6 months	3	13	1	4	0	0	6	24	4	17	3	13
Every year	4	17	4	17	1	4	0	0	4	17	3	13
Less than once a year	2	9	3	13	2	9	2	8	3	13	3	13
Never	1	4	1	4	2	9	1	4	5	21	6	25
Don't know	0	0	1	4	4	17	2	8	3	13	3	13
When necessary	2	9	2	8	1	4	2	8	2	8	2	8
Total	**23**	**100**	**24**	**100**	**23**	**100**	**25**	**100**	**24**	**100**	**24**	**100**

Table 12. Use of Climate Information

	Past weather data (such as historical weather observations)		Past climate data (such as historical climate averages)		Weather forecast (forecasts from hours up to 2 weeks into the future)		Seasonal climate forecasts (forecasts for next month up to a year into the future)		Inter-annual climate predictions (predictions for next year up to 10 years into the future)		Climate change projections (30 years and beyond)	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
This information is analysed within the organization and then integrated in our models and/or research	4	17	4	17	2	8	1	5	1	4	3	12
The information is analysed outside the organization and then integrated in our models and/or research	2	8	1	4	0	0	0	0	2	8	2	8
The information is used to help inform and manage our day-to-day operational activities	7	29	5	21	14	58	8	38	2	8	0	0
The information is used to inform strategic planning	9	38	11	46	3	13	8	38	13	52	16	64
Don't know	1	4	2	8	2	8	2	10	3	12	1	4
Not Applicable	1	4	1	4	3	13	2	10	4	16	3	12

Total	**24**	**100**	**24**	**100**	**24**	**100**	**21**	**100**	**25**	**100**	**25**	**100**

Table 13. Awareness of CIMH Climate Products and Tools

	Caribbean Standardised Precipitation Index (SPI) Outlook		**Caribbean Drought Bulletin**		**CariCOF Caribbean Climate Outlook Newsletter**		**CariCOF Precipitation Outlook**		**CariCOF Temperature Outlook**		**CariCOF Drought Outlook**		**Regional Agroclimatic Bulletin**		**Caribbean Dewetra platform**		**Climate Impacts Database**	
	n	**% of total respondents**	**n**	**% of total respondents**	**n**	**% of total respondents**	**n**	**% of total respondents**	**n**	**% of total respondents**	**n**	**% of total respondents**	**n**	**% of total respondents**	**n**	**% of total respondents**	**n**	**% of total respondents**
Not aware	4	14	5	18	4	14	6	22	9	30	7	25	17	68	14	50	17	61
Aware	24	86	23	82	24	86	21	78	21	70	21	75	8	32	14	50	11	39
Total	**28**	**100**	**28**	**100**	**28**	**100**	**27**	**100**	**30**	**100**	**28**	**100**	**25**	**100**	**28**	**100**	**28**	**100**

Table 14. Usability of CIMH Climate Products and Tools

	Caribbean Standardised Precipitation Index (SPI) Outlook		Caribbean Drought Bulletin		CariCOF Caribbean Climate Outlook Newsletter		CariCOF Precipitation Outlook		CariCOF Temperature Outlook		CariCOF Drought Outlook		Regional Agroclimatic Bulletin		Caribbean Dewetra platform		Climate Impacts Database	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
Not usable at all	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not usable	1	4	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0
Neither usable nor not usable	2	7	1	4	0	0	0	0	0	0	0	0	3	13	5	19	4	16
Usable	9	33	13	46	16	59	13	50	9	47	12	52	5	22	2	7	5	20
Very usable	11	41	12	43	10	37	12	46	9	47	10	43	6	26	10	37	6	24
Don't know	3	11	1	4	0	0	0	0	1	5	0	0	5	22	9	33	9	36
Not applicable	1	4	1	4	1	4	1	4	0	0	1	4	3	13	1	4	1	4
Total	**27**	**100**	**28**	**100**	**27**	**100**	**26**	**100**	**19**	**100**	**23**	**100**	**23**	**100**	**27**	**100**	**25**	**100**

Table 15. Sources of Weather and Climate Information

	Past weather data (such as historical weather observations)		Past climate data (such as historical climate averages)		Weather forecast (forecasts from hours up to 2 weeks into the future)		Seasonal climate forecasts (forecasts for next month up to a year into the future)		Inter-annual climate predictions (predictions for next year up to 10 years into the future)		Climate change projections (30 years a	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
NMHS	7	27	8	32	7	27	3	12	3	11	2	8
CIMH	2	8	2	8	2	8	8	31	6	22	3	12
NMHS + CIMH	3	12	2	8	2	8	3	12	3	11	2	8
Gov. agency/Dept	4	15	4	16	6	23	2	8	2	7	1	4
Research institute	1	4	0	0	0	0	0	0	4	15	3	12
Private company	0	0	0	0	0	0	0	0	0	0	0	0
Own data	1	4	2	8	0	0	0	0	0	0	0	0
Other sources of info	0	0	0	0	1	4	0	0	3	11	3	12
Don't Know	0	0	0	0	0	0	0	0	1	4	3	12
Not Applicable	1	4	1	4	1	4	2	8	2	7	2	8
Cimh+Govt agency/dept	1	4	1	4	1	4	3	12	0	0	0	0
CIMH+Other sources of info	0	0	0	0	0	0	2	8	1	4	2	8

	Past weather data (such as historical weather observations)		Past climate data (such as historical climate averages)		Weather forecast (forecasts from hours up to 2 weeks into the future)		Seasonal climate forecasts (forecasts for next month up to a year into the future)		Inter-annual climate predictions (predictions for next year up to 10 years into the future)		Climate change projections (30 years a	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
Govt agency/dept + Research Institute	1	4	0	0	0	0	0	0	0	0	1	4
NMHS + Own data	1	4	1	4	1	4	1	4	1	4	0	0
NMHS + CIMH + Own data	1	4	0	0	0	0	0	0	0	0	0	0
NMHS + CIMH + Own data + Other sources of info	0	0	1	4	0	0	0	0	0	0	0	0
Cimh + Govt agency/dept + Research Institute	0	0	1	4	0	0	0	0	0	0	1	4
CIMH + Reseacrh Institute	0	0	0	0	1	4	0	0	0	0	0	0
Govt Agency/dept + Research Institute + Own Data	0	0	0	0	1	4	0	0	0	0	1	4
Govt Agency/dept + other sources of info	0	0	0	0	0	0	0	0	1	4	0	0
NMHS + Govt Agency/dept	1	4	1	4	1	4	0	0	0	0	0	0
NMHS + CIMH + Govt Agency/dept	1	4	1	4	1	4	2	8	0	0	0	0
CIMH + Govt agency/dept + Research Institute + Private Company + Own data	1	4	0	0	0	0	0	0	0	0	0	0
CIMH Govt Agency/dept + Research Institute + Private Company	0	0	0	0	0	0	0	0	0	0	1	4

	Past weather data (such as historical weather observations)		Past climate data (such as historical climate averages)		Weather forecast (forecasts from hours up to 2 weeks into the future)		Seasonal climate forecasts (forecasts for next month up to a year into the future)		Inter-annual climate predictions (predictions for next year up to 10 years into the future)		Climate change projections (30 years a	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
NMHS + Private Company	0	0	0	0	1	4	0	0	0	0	0	0
Total Answered	**26**	**100**	**25**	**100**	**26**	**100**	**26**	**100**	**27**	**100**	**25**	**100**

Table 16. Interaction with Climate Information Providers

	National Meteorological and Hydrological Services		Caribbean Institute for Meteorology and Hydrology		Caribbean Community Climate Change Centre		Climate Studies Group, UWI, Mona	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
Low	7	28	8	31	13	50	10	42
Moderate	8	32	9	35	6	23	6	25
High	8	32	7	27	5	19	2	8
Don't know	1	4	1	4	2	8	6	25
Not applicable	1	4	1	4	0	0	0	0
Total	**25**	**100**	**26**	**100**	**26**	**100**	**24**	**100**

Table 17. Barriers to climate information use

	We do not know what climate information is available		The information available does not suit our needs		The information available is not user friendly		We do not have in-house expertise to use this information		The level of detail provided is not appropriate to support organizational decisions		Other	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
Strongly disagree	1	8	2	17	1	8	1	8	2	17	0	0
Disagree	4	33	4	33	4	33	3	23	2	17	0	0
Neither agree/disagree	3	25	2	17	4	33	1	8	3	25	0	0
Agree	4	33	2	17	3	25	8	62	3	25	0	0
Strongly agree	0	0	1	8	0	0	0	0	2	17	1	50
Don't know	0	0	1	8	0	0	0	0	0	0	1	50
Total	**12**	**100**	**12**	**100**	**12**	**100**	**13**	**100**	**12**	**100**	**2**	**100**

Table 18. Respondent perceptions of the value of CariCOF

	I routinely try to integrate climate information considerations into my professional decisions		I need more exposure and training to build my capacity to integrate climate information considerations into my professional decisions	
	n	**% of total respondents**	**n**	**% of total respondents**
Strongly disagree	0	0	0	0
Disagree	0	0	1	4
Neither agree/disagree	1	5	1	4
Agree	14	64	5	22
Strongly Agree	7	32	16	70
Don't know	0	0	0	0
Total Answered	**22**	**100**	**23**	**100**

Table 19. Usability of Proposed Climate Information/Products

	Bush fire outlook		Extreme precipitation outlook		Coral reef bleaching outlook		Heatwave outlook		Hydrological outlook		A database of historical climate impacts		A menu of sector specific response strategies associated with climate forecasts	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
Not usable at all	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not usable	0	0	0	0	1	4	0	0	0	0	1	4	1	4
Neither usable nor not usable	0	0	0	0	3	12	1	4	0	0	0	0	0	0
Usable	4	15	8	29	8	31	14	56	10	36	11	39	9	35
Very usable	15	58	20	71	5	19	7	28	17	61	16	57	15	58
Don't know	3	12	0	0	2	8	1	4	1	4	0	0	0	0
Not applicable	4	15	0	0	7	27	2	8	0	0	0	0	1	4
Total Answered	**26**	**100**	**28**	**100**	**26**	**100**	**25**	**100**	**28**	**100**	**28**	**100**	**26**	**100**

Tables 20, 21, 22, 23. Usefulness of BRCCC Programme proposed Outputs

Table 20. Outcome Area I: Established relationships between meteorologists/climatologists, scientists from other sectors and policymakers from across sectors

	Sector specific climate service webpages on the CIMH website		Sector specific communication packages of multi-media materials		Sector specific sessions at the CariCOF 2015-2016	
	n	% of total respondents	n	% of total respondents	n	% of total respondents
Not useful at all	0	0	0	0	0	0
Not useful	0	0	0	0	0	0
Neither useful nor not useful	0	0	1	3	0	0
Useful	12	40	14	48	14	48
Very useful	18	60	13	45	15	52
Don't know	0	0	0	0	0	0
Not applicable	0	0	1	3	0	0
Total	**30**	**100**	**29**	**100**	**29**	**100**

Table 21. Outcome Area II: Initiation of the development, deployment and platform integration of sector specific forecasting/planning models in the form of early warning systems

	Sector specific impact models		Caribbean Dewetra User Toolkit		Online Caribbean Dewetra module		Caribbean Dewetra training workshops	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
Not useful at all	0	0	0	0	0	0	0	0
Not useful	0	0	0	0	0	0	0	0
Neither useful nor not useful	1	4	1	3	1	4	1	3
Useful	10	36	11	38	9	32	6	21
Very useful	17	61	10	34	11	39	16	55
Don't know	0	0	7	24	7	25	6	21
Not applicable	0	0	0	0	0	0	0	0
Total	**28**	**100**	**29**	**100**	**28**	**100**	**29**	**100**

Table 22. Outcome Area III: Increased institutional capacity

	Sector specific Outreach Workshops		Baseline information regarding user needs for climate services		Baseline information regarding provider capacity to deliver climate services		Development of a 10 year sectoral EWISACTs Plan of Action	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
Not useful at all	0	0	0	0	0	0	0	0
Not useful	0	0	1	4	1	3	0	0
Neither useful nor not useful	0	0	0	0	0	0	2	7
Useful	11	39	13	46	13	45	14	50
Very useful	17	61	13	46	13	45	11	39
Don't know	0	0	1	4	2	7	1	4
Not applicable	0	0	0	0	0	0	0	0
Total	**28**	**100**	**28**	**100**	**29**	**100**	**28**	**100**

Table 23. Outcome Area IV: Enhanced adaptive capacity

	Research on how climate negatively/positively impacts climate-sensitive sectors		Interface tool in the Climate Impacts Database enabling users to correlate forecasts to past impacts and appropriate response strategies		Sector specific climate product prototypes		Sector specific climate products integrated into the Caribbean Dewetra platform		Case studies demonstrating how existing climate information has improved sectoral decision-making		Monthly sectoral EWISACTs bulletins	
Not useful at all	0	0	0	0	0	0	0	0	0	0	0	0
Not useful	0	0	0	0	0	0	1	4	0	0	0	0
Neither useful nor not useful	0	0	0	0	0	0	1	4	0	0	1	3
Useful	9	31	11	38	16	55	11	39	11	38	13	45
Very useful	19	66	17	59	10	34	9	32	18	62	13	45
Don't know	1	3	0	0	3	10	6	21	0	0	2	7
Not applicable	0	0	1	3	0	0	0	0	0	0	0	0
Total	**29**	**100**	**29**	**100**	**29**	**100**	**28**	**100**	**29**	**100**	**29**	**100**

Table 24. Modes of future involvement with the BRCCC Programme

	Participate in future outreach and training workshops		Take part in interviews with the research team		Participate in the testing of climate product prototypes		Provision of sectoral datasets		Other	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
No	0	0	0	0	0	0	0	0	0	0
Yes	29	97	25	89	24	83	22	79	0	0
Maybe	1	3	3	11	5	17	4	14	3	100
Don't know	0	0	0	0	0	0	2	7	0	0
Total	**30**	**100**	**28**	**100**	**29**	**100**	**28**	**100**	**3**	**100**

Table 25. Perceptions on the Sustainability of Climate Services

	Climate services are of little value in my organization's operations and planning		Climate services should be provided free of charge on a regular basis through electronic media		I would like to gather climate information on my own at a user-friendly and easily accessible website		The Caribbean should continue to invest in building its climate services capacity		A regional framework for climate services is desirable		My organization is willing to participate in a process to develop a regional framework for climate services	
	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents	n	% of total respondents
Strongly disagree	18	62	0	0	0	0	0	0	0	0	0	0
Disagree	11	38	2	7	0	0	0	0	0	0	0	0
Neither agree/disagree	0	0	6	20	2	7	0	0	0	0	3	10
Agree	0	0	15	50	19	66	6	21	9	30	11	38
Strongly agree	0	0	7	23	8	28	23	79	20	67	13	45
Don't know	0	0	0	0	0	0	0	0	1	3	2	7
Total	**29**	**100**	**30**	**100**	**29**	**100**	**29**	**100**	**30**	**100**	**29**	**100**

APPENDIX C: Draft Sectoral EWISACTs WIP Summary

Outputs were drawn from the draft Work and Implementation Plan (WIP) for sectoral EWISACTs which recognizes that there are limitations and gaps within the provider and user communities related to the development of seasonal capabilities in the agriculture, water, disaster risk management, health, tourism and energy sectors. In proposing concrete outputs for the period 2015-2016. The WIP's main focus is to address the gaps in meeting the needs of six climate sensitive sectors in four (4) Outcome Areas (OAs) (Table 26):

Table 26. Outcome Areas, Gaps and Proposed Outputs

Outcome Area	Gap Ref.	Current Gap(s)	Outputs
I. Established relationships between meteorologists/ climatologists, scientists from other sectors and policymakers from across sectors	1.1	Limited number of sectors (agriculture, water, disaster risk management) in which climate products have been mainstreamed	1.1.1 Sector specific webpages 1.1.2 Communication package of multi-media materials
	1.2	Limited number of technical sectoral interfaces	1.2.1 Sector specific sessions at the Caribbean Climate Outlook Forum (CariCOF) General Assemblies 2015-2016
	1.3	Ad hoc nature of sectoral relationships	1.3.1 Memoranda of Understanding (MoUs)/ Letters of Agreement (LoAs) signed between Caribbean Institute for Meteorology and Hydrology (CMO)/ Caribbean Institute for Meteorology and Hydrology (CIMH) and sector specific regional agencies for formal collaboration on the climate service agenda
II. Development, deployment and platform integration of sector specific forecasting/planning models in the form of early warning systems	2.1	No standardized decision support system (DSS) to support sectoral Early Warning Information System Across Climate Timescales (EWISACTs)	2.1.1 Report exploring data sharing and integration of sectoral datasets and sectoral DSSs into the Caribbean Dewetra platform
	2.2	Limited use of sector specific impact models	2.2.1 Sector specific impact models integrated and/or developed
	2.3	Limited sectoral capacity to use the Caribbean Dewetra platform	2.3.1 Caribbean Dewetra User Toolkit (eg. handouts, exercises, user manual, online video tutorials) 2.3.2 Online Caribbean Dewetra module 2.3.3 Caribbean Dewetra training workshops
III. Institutional capacity	3.1	Lack of management, coordination and ownership mechanism anchored in and driven by sectoral partners and the national context	3.1.1Report documenting the legal and institutional context (frameworks, agreements, policies, laws, barriers and enabling factors) at the international, regional and national levels for the implementation of Sectoral EWISACTs 3.1.2 Management mechanisms at the regional level (eg. the Consortium of Regional Sectoral EWISACTs Coordination Partners)

			3.1.3 Management mechanisms at the national level (eg. National Disaster Management Committees) 3.1.4 Outreach Workshops
	3.2	Insufficient baselines (re: user needs, provider capacity) to inform product tailoring and development	3.2.1 Research report baselining user needs and providers' capacity to deliver climate products that satisfy user needs 3.2.2 Sectoral EWISACTs Plan of Action 2017-2027
IV. Adaptive capacity	4.1	Weak linkages between climate forecasts, impact and concrete action	4.1.1 Report on how climate negatively/positively impacts climate-sensitive sectors 4.1.2 Interface tool in Climate Impacts Database (CID) enabling users to correlate forecasts to past impacts and appropriate response strategies 4.1.3 Sector specific climate product prototypes 4.1.4 Sector specific climate products integrated into the Caribbean Dewetra platform
	4.2	Little documented evidence of how climate information improves secotal decision-making in the Caribbean	4.2.1 Case studies demonstrating how existing climate information has improved decision-making
	4.3	No formal mechanism to translate and communicate sectoral implications of monthly climate outlook products	4.3.1 Monthly sectoral EWISACTs bulletins

Source: Mahon, Rankine, Trotman (2015)