



The Programme for Building Regional Climate Capacity in the Caribbean (BRCCC Programme)

Component 4.1: Development of the Regional Climate Centre (RCC)

Technical Area III: Development of Seasonal Forecasting Capabilities to apply to Climate-Sensitive Sectors in the Caribbean

WORK AND IMPLEMENTATION PLAN 2015-2016

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About the Caribbean Institute for Meteorology and Hydrology (CIMH)

The CIMH is an Institution of the Caribbean Community (CARICOM) and the technical Organ of the Caribbean Meteorological Organization (CMO). The mandate of the CIMH is to assist in improving and developing the National Meteorological and Hydrological Services (NMHSs), as well as, providing the awareness of the benefits of Meteorology and Hydrology for the economic well-being of the CIMH Member States. This is achieved through training, research, investigations, and the provision of related specialized services and advice. The specific functions of CIMH include:

1. **World Meteorological Organization (WMO) Regional Training Centre (RTC):** CIMH trains professionals in operational meteorology and hydrology and the climate sciences. CIMH is also responsible for the delivery of courses for the completion of the BSc Degree in Meteorology at the University of the West Indies.
2. **Centre for research in Meteorology, Hydrology, Climatology and Associated Sciences:** The Institute is the leading institution in the English-speaking Caribbean engaged in focused and inter-disciplinary research in tropical meteorology, tropical climatology, hydrology and water resources management. This often necessitates collaboration with other relevant regional national and international organisations.
3. **Regional Climate and Hydrological Data Centre:** Since its inception, the Institute has been used by Member States of the CMO as a location for the region's climate data archive. As part of this responsibility, the Institute is responsible for collecting the region's climate data, quality assuring the data, archiving the data and disseminating the data to regional and international stakeholders.
4. **Regional Instrument Centre (RIC):** In its capacity as the RIC for Member States of the CMO, the Institute supports instrument calibration, instrument maintenance and repair, identification of appropriate instruments for the region and instrument procurement and installation. In addition, the Institute conducts training programmes in instrument maintenance and calibration for persons from and outside of the region. The Institute is also active in research and development leading to the development of new instruments and better instrument maintenance programmes.
5. **Regional Centre of Excellence for Training in Satellite Meteorology:** CIMH is one of the network of thirteen training Centres of Excellence worldwide established by WMO that actively participating in the Virtual Laboratory for Training and Education in Satellite Meteorology (VLab) programme. These Centres are working together to improve the utilization of data and products from meteorological and environmental satellites.
6. **Regional Climate Centre:** CIMH has already established itself as the primary provider of climate services and products to the several socio-economic sectors in the Caribbean. Seeking to establish itself as a WMO Regional Climate Centre for the Caribbean, CIMH launched the Demonstration Phase in April 2013, as it builds toward full designation.
7. **Caribbean Centre for Climate and Environmental Simulations (CCCES):** The CCCES was established in 2014 at the CIMH through support from the USAID BRCCC Programme. The CCCES is part of the region's strategy to build and sustain regional resilience to the risk posed by climate change, increasing climate variability, extreme weather and increasing environmental degradation and change. The CCCES addresses resilience in these areas by providing CARICOM scientists, engineers and researchers with state-of-the-art computations resources to conduct complex simulations and analyses within and across disciplines on a range of scenarios (cover varying spatial and temporal scales) to adequately identify, bound and mitigate the drivers of risk to the social and economic development of the Caribbean.

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LIST OF ACRONYMS

| Acronym | Definition |
|-----------------|---|
| AMC | Applied Meteorology and Climatology |
| BRCCC | Building Regional Climate Capacity in the Caribbean (Programme) |
| CAMI | Caribbean Agrometeorological Initiative |
| CARDI | Caribbean Agricultural Research & Development Institute |
| CariCOF | Caribbean Climate Outlook Forum |
| CARICOM | Caribbean Community |
| CARIWIN | Caribbean Water Initiative |
| CARPHA | Caribbean Public Health Authority |
| CCCCC | Caribbean Community Climate Change Centre |
| CCREEE | Caribbean Centre for Renewable Energy and Energy Efficiency |
| CDEMA | Caribbean Disaster Emergency Management Agency |
| CDM | Comprehensive Disaster Management |
| CDPMN | Caribbean Drought Precipitation Monitoring Network |
| CHTA | Caribbean Hotel & Tourism Association |
| CID | Climate Impacts Database |
| CIMH | Caribbean Institute for Meteorology and Hydrology |
| CMO | Caribbean Meteorological Organization |
| CRCA | Caribbean Region Climate Adaptation (Partnership Initiative) |
| CTO | Caribbean Tourism Organization |
| CWWA | Caribbean Water and Wastewater Association |
| CARIWIN | Caribbean Water Initiative |
| DRM | Disaster Risk Management |
| DSS | Decision Support System |
| ERC | Enhancing Resilience to Reduce Vulnerability in the Caribbean (Project) |
| EWISACTs | Early Warning Information System Across Climate Timescales |
| GFCs | Global Framework for Climate Services |
| GIS | Geographic Information Systems |
| ICT | Information and Communications Technology |
| IWRM | Integrated Water Resources Management |
| NCOF | National Climate Outlook Forum |
| NMHS | National Meteorological and Hydrological Services |
| NWIS | National Water Information System |
| NSEC | National Sectoral EWISACTs Committee |
| OA | Outcome Area |
| PSC | Programme Steering Committee |
| LoA | Letter of Agreement |
| RCC | Regional Climate Center |
| USAID | United States Agency for International Development |
| WIP | Work and Implementation Plan |

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EXECUTIVE SUMMARY

The Work and Implementation Plan (WIP) for Component 4.1, Technical Area III: *Development of Seasonal Forecasting Capabilities to apply to Climate-Sensitive Sectors* of the Building Regional Climate Capacity in the Caribbean Programme (BRCCC Programme) recognizes that there are limitations and gaps within the provider and sectoral user communities related to the development of seasonal forecasting capabilities in the agriculture and food security, water, disaster risk management, health, tourism and energy sectors in the Caribbean region. The intention is to design sector specific products, services and capacity building efforts that begin to address these gaps. These efforts and their tangible outputs underpin the development of sectoral Early Warning Information across Climate Timescales (EWISACTs) by the Caribbean Institute for Meteorology and Hydrology (CIMH) and its regional sectoral partners in the Caribbean.

The WIP is for the period June 2015 - December 2016 (18 months). It proposes the development of several outputs to address eight (8) gaps across four (4) Outcome Areas (OAs). Table 1 provides a summary.

Table 1. Outcome Area, Associated Gaps, Work Plan

| Outcome Area | Gap Ref. | Current Gap(s) | Outputs | Targets | Timeline |
|---|----------|---|--|---|-------------------|
| <i>I. Established relationships between meteorologists/climatologists, scientists from other sectors and policymakers from across sectors</i> | 1.1 | Limited number of sectors (e.g., agriculture and food security, water, disaster risk management, health) in which awareness and use of climate products has been mainstreamed | 1.1.1 Communication package of generic and sector specific products and materials | <ul style="list-style-type: none"> • 4-6 sector specific webpages developed and accessible • 10 product information sheets • 4-6 general and sector-specific infographics | Q3 2015 - Q2 2016 |
| | 1.2 | Limited number of technical sectoral interfaces at the regional and national levels | 1.2.1 Sector specific technical sessions at regional technical meetings such as the Caribbean Climate Outlook Forum (CariCOF) General Assemblies 2015-2016 | <ul style="list-style-type: none"> • Sector specific programming (4-6 sector sessions) by December 2016 • 30-50% increase in sectoral participants' knowledge of climate information, products and services (based on pre and post knowledge evaluations) | Q3 2015 – Q4 2016 |
| | | | 1.2.2 A series of regional cross-sectoral and/or sector specific technical | <ul style="list-style-type: none"> • 4-6 cross-sectoral and/or sector-specific regional webinars convened | Q12016-Q4 2016 |

| Outcome Area | Gap Ref. | Current Gap(s) | Outputs | Targets | Timeline |
|---|----------|---|---|--|-------------------|
| | | | webinars | | |
| | | | 1.2.3 National Sectoral EWISACTs Workshops | <ul style="list-style-type: none"> • 3-5 National Sectoral EWISACTs Workshops convened • 30-50% increase in participants' knowledge of climate information, products and services (based on pre versus post knowledge) | Q42016 – Q2 2016 |
| | 1.3 | Ad hoc sectoral relationships | 1.3.1 LoAs signed between CIMH and sector specific regional agencies for formal collaboration on the climate services agenda | <ul style="list-style-type: none"> • 4-6 LoAs signed | Q1 2015 – Q1 2016 |
| II. <i>Initiation of the development, deployment and platform integration of sector specific forecasting/planning models in the form of early warning systems</i> | 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/with the Caribbean Dewetra platform | <ul style="list-style-type: none"> • Report shared by email, presentation and available for download from RCC website by December 2016 | Q12016- Q2 2016 |
| | 2.2 | Limited number of sector specific climate indices and impact models for the Caribbean context | 2.2.1 Sector specific climate index/indices developed and/or co-developed | <ul style="list-style-type: none"> • 3-5 sector specific climate index/indices | Q12016– Q4 2016 |
| III. <i>Enhanced institutional capacity</i> | 3.1 | Insufficient baselines (re: user needs, provider capacity) to inform product tailoring and development in the short- and long-term | 3.1.1 Research report baselining user needs and providers' capacity to deliver climate products that satisfy user needs | <ul style="list-style-type: none"> • Baseline report shared by email, presentation and available for download from RCC website by December 2016 | Q32015– Q4 2016 |
| | | | 3.1.2 Sectoral EWISACTs Plan of Action 2017-2027 | <ul style="list-style-type: none"> • Sectoral EWISACTs Plan of Action 2017-2027 shared by email, presentation and available for download from RCC website by December 2016 | Q32016- Q4 2016 |

| Outcome Area | Gap Ref. | Current Gap(s) | Outputs | Targets | Timeline |
|---------------------------------------|----------|--|---|--|----------------|
| | 3.2 | Lack of governance mechanisms anchored in and driven by sectoral partners and the regional and national contexts | 3.2.1 Governance mechanisms at the regional level (e.g., the Consortium of Regional Sectoral EWISACTs Coordination Partners) | • Regional coordination mechanism with 6 sectoral partners established and functioning by December 2016 | Q22015–Q4 2015 |
| | | | 3.2.2 Consortium landing page and associated functionalities (e.g., members only area accessible through login) | • Consortium landing page and associated functionalities developed and functional by December 2016 | Q12016–Q4 2016 |
| | | | 3.2.2 Governance mechanisms at the national level (e.g., National Sectoral EWISACTs Committees) | • 1-2 National Sectoral EWISACTs Committees established and functioning by December 2016 | Q42015–Q4 2016 |
| IV. <i>Enhanced adaptive capacity</i> | 4.1 | Weak linkages between climate forecasts, impact and concrete action | 4.1.1 Report on the relationship between climate and sectoral productivity, historical climate impacts and sectoral response; and the impact of climate outlooks on sectoral response | • Research Report shared by email, presentation and available for download from RCC website by December 2016 | Q42015–Q3 2016 |
| | | | 4.1.2 Design of a web-based user interface tool enabling users to correlate forecasts to past impacts and appropriate response strategies | • 1 interface tool designed | Q12016–Q4 2016 |
| | 4.2 | Little documented evidence of how climate information improves sectoral | 4.2.1 Case study briefs demonstrating how existing climate information has | • 4-6 case study briefs developed and published | Q12016–Q4 2016 |

| Outcome Area | Gap Ref. | Current Gap(s) | Outputs | Targets | Timeline |
|--------------|----------|----------------------------------|---|---------|----------|
| | | decision-making in the Caribbean | been incorporated into sectoral decision-making | | |

While there are risks associated with the development of sectoral EWISACTs (such as the passage of a hurricane during the annual Atlantic hurricane season, or a change in the leadership or direction of sectoral partners), the implementation risks for the proposed suite of outputs can generally be considered to be low. Indicators, targets and timelines have been developed to measure and track progress associated with each Output. Progress will be reviewed by the Consortium of Regional EWISACTs Coordination partners, the BRCCC Programme Project Steering Committee and via the work of an independent, third party. At the operational level, CIMH will fully integrate the long-term sectoral EWISACTs development process into its annual work plan and the biannual CariCOF process thus ensuring that the Outputs produced under Component 4.1, Technical Area III, endure beyond the BRCCC Programme.

1.0 Introduction

The main sectoral drivers of socio-economic development of Caribbean states remain highly reliant on and sensitive to climate. The CIMH has a longstanding history as regional driver (and focal point) for hydrological, meteorological and climate services in the Caribbean. An assessment of previous sectoral activities revealed that the large majority of the Caribbean Institute for Meteorology and Hydrology's (CIMH) effort to date has been focused on engaging the Agriculture and Food Security, Water and more recently, the Disaster Risk Management (DRM) sectors. While some work has been done with the Health sector, there has been minimal engagement of the Tourism and Energy sectors (see Table 2).

Table 2. Summary of past sectoral activities/initiatives conducted by the CIMH with 6 climate-sensitive sectors

| Sector | Previous activities/initiatives |
|-------------------------------|--|
| Agriculture and Food Security | <ul style="list-style-type: none"> • Caribbean Climate Outlook Forum (CariCOF) participation (2010-2015) • Caribbean Agrometeorological Initiative (CAMI) Project (February 2010 - 2013): <ul style="list-style-type: none"> ○ National and regional post CAMI bulletins ○ CAMI Policy Brief • <i>Roadmap for Climate Services in Belize</i> (forthcoming) developed with a major emphasis on agriculture • Participation in the Global Framework for Climate Services (GFCS) Meeting (Trinidad, May 2013) • Caribbean Agricultural Research & Development Institute (CARDI) represented on the BRCCC Programme Steering Committee |
| Water | <ul style="list-style-type: none"> • Caribbean Water Initiative (CARIWIN) (February 2007-2012): <ul style="list-style-type: none"> ○ Launch of the Grenada National Water Information System (NWIS)¹ (January 2009) ○ Launch of the Caribbean Drought and Precipitation Monitoring Network (CDPMN) - a regional network hosted at CIMH that centralizes data and indices for the monitoring of drought and wet episodes in the Caribbean (2009) ○ National drought training under the Caribbean Drought Precipitation Monitoring Network (CDPMN) ○ Procurement and installation of instrumentation for monitoring water level and rainfall in pilotsites in Grenada, Guyana and Jamaica. Several training workshops held in partner countries on topics of Integrated Water Resources Management (IWRM), hydrological data and measurements, flood analysis, climate change, watershed and groundwater modeling, Geographic Information Systems (GIS) and water resources, hydrometeorology and water quality • United States Agency for International Development (USAID)/Higher Education for Development (HED) Caribbean Region Climate Adaptation (CRCA) Partnership Initiative (July 2012-June 2015) focused on building capacity to manage water resources by developing short courses for meteorologists and water professionals • Participation in CariCOF (2010-2015) • Drought Monitoring and Planning training (May 2012, Jan 2015) • Participation in the GFCS Meeting (Trinidad, May 2013) |
| DRM | <ul style="list-style-type: none"> • CIMH participation in the Caribbean Comprehensive Disaster Management Conferences |

¹ A tool that provides timely information in a format both understandable and convenient for decision-makers, planners and the public.

| Sector | Previous activities/initiatives |
|---------|--|
| | <ul style="list-style-type: none"> • Real-Time Flood Forecasting for the Caribbean Project (2008-2011) • CIMH has provided technical information in the area of hydrometeorology which supports Caribbean Disaster Emergency Management Agency's (CDEMA) scenario development and response activities for weather, climate and hydrological hazards • Participation in CariCOF (2010-2015) • Countries (Saint Lucia, Grenada and Jamaica) have taken part in a joint programme on drought between CIMH and CDEMA (2013). Co-development of draft drought plans for early warning under a broader framework for drought management • Under the "Enhancing Resilience to Reduce Vulnerability in the Caribbean (ERC)" Project (2011-2014) the Caribbean Dewetra platform was customized for hydrometeorological hazards • CIMH at the request of CDEMA and its Participating States, has visited countries impacted by significant hydrometeorological events to collect data essential for characterizing the magnitude of the event and the resulting impacts. If sufficient data is available, return periods for the events are determined • CIMH has completed and supported a number of damage assessments and feasibility studies some of which support damage and loss estimation • CIMH has worked with CDEMA and other partners to expand and support new and existing hydro-meteorological networks across the Caribbean region • CIMH and CDEMA attend each other's Board meetings and Technical Advisory Committees, and share annual work programmes to ensure synergy of planned actions • Climate Impacts Database (CID) developed with DRM focus under the USAID/HED CRCA Partnership Initiative (2012-2015) • In 2013, CIMH expanded the services offered to the disaster management community in the areas of hydrometeorological impacts forecasting and drought forecasting • Participation in the GFCS Meeting (Trinidad, May 2013) • CIMH hosted a Pre-TAC Meeting in April, 2014 under the caption 'Climate related tools for sustainable planning, adaptation and mitigation in the disaster risk management (DRM) sector' • Caribbean Disaster Emergency Management Agency (CDEMA) represented on the BRCCC Programme Steering Committee (2014-2017) |
| Health | <ul style="list-style-type: none"> • CariCOF participation (2012-2015) • Participation in the GFCS Meeting (Trinidad, May 2013) • Dominica national consultation (August 2014) • <i>Roadmap for Climate Services in Dominica</i> developed with a major emphasis on health • CIMH representative has attended two health sector meetings convened by the Caribbean Public Health Authority (CARPHA) (2014, 2015) • CARPHA represented on the Building Regional Climate Capacity in the Caribbean (BRCCC) Programme Steering Committee (2014-2017) • Webinar on the health sector in Dominica (April 2015) |
| Energy | <ul style="list-style-type: none"> • Partnership with the CARICOM Secretariat to implement the Project "Establishment of Regional Capacity and Expertise for Addressing the Impacts of Future Climate Change on the Energy Demand in CARICOM Member States". Initiation of research to develop a model framework for the enhancement of regional capacity to address the impacts of future climate change and climate variability on the energy sector |
| Tourism | <ul style="list-style-type: none"> • CariCOF participation (2013-2015) • GFCS Meeting (Trinidad, May 2013) |

Source: CIMH (n.d.), USAID/HED (2014)

This summary of past sectoral activities and initiatives points to the embryonic status of the application of climate science in climate-sensitive sectors in the Caribbean. However, given that EWISACTs hold the potential to be of great value by providing early warning of potential impacting climatic events that may have implications for a wide range of climate-sensitive sectoral decisions, the CIMH with the support of the American People, through the United States Agency for International Development (USAID) will invest in improving the range and use of climate-related products and services at appropriate spatio-temporal scales to sectoral decision-makers.

The Work and Implementation Plan (WIP) for sectoral EWISACTs recognizes that there are limitations and gaps within the provider and user communities related to the development of seasonal capabilities in the agriculture and food security, water, disaster risk management, health, tourism and energy sectors. Its main focus is to address the gaps in meeting the needs of six climate-sensitive sectors in four (4) Outcome Areas (OAs):

- I. Established relationships between meteorologists/climatologists, scientists from other sectors and policymakers from across sectors;
- II. Initiation of the development, deployment and platform integration of sector specific forecasting/planning models in the form of early warning systems;
- III. Enhanced institutional capacity; and
- IV. Enhanced adaptive capacity.

Several concrete Outputs to be implemented under each Outcome Area were identified by the CIMH team from January-May 2015. The initial criteria for the identification of Outputs are outlined below:

1. Outputs are aligned with an identified Outcome Area under Component 4.1, Technical Area III;
2. Outputs address at least one of the gaps under each OA in meeting the needs of climate-sensitive sectors; and
3. Outputs are achievable within an 18 month timeframe.

Output identification was also related to the methodological approach outlined in Section 4.1.5 of the Conceptual Framework and Methodology document (Mahon, Rankine et al. 2015).

The final selection of Outputs for the WIP for the development of sectoral EWISACTs is based on a synthesis and rationalization of views gleaned through a consultative and collaborative process from June-October 2015. Five major sources inform the final selection of outputs:

1. A survey of a sample of 32 sectoral end-users on proposed sectoral EWISACTs outputs (Mahon, Rankine et al. 2015);
2. A survey of 15 national providers (NMHSs) on proposed sectoral EWISACTs outputs (Mahon, Rankine et al. Forthcoming);

3. Collaborative discussions with 6 regional sectoral partner agencies² on proposed sectoral EWISACTs outputs from January-October 2015;
4. Internal discussion and rationalization by the CIMH rationalization of what is achievable in the Programme's timeframe given the Institute's financial and human resources from January-October 2015; and
5. A final, overarching discussion with regional sectoral partners, regional observer organizations and national sectoral organisations at the 2nd Consortium Meeting of Regional Sectoral EWISACTs Coordination Partners convened on October 21-22, 2015.

2.0 Sectoral EWISACTs Work Plan

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

Outcome Area I focuses on establishing and/or strengthening the relationship between providers of climate information and sectoral users.

The first gap associated with this Outcome Area relates to the limited number of sectors in which awareness and use of climate products have been mainstreamed. Through the CariCOF process and other initiatives like the Caribbean AgroMeteorological Initiative (CAMI) and the Caribbean Water Initiative (CARIWIN), CIMH has reached out to some socio-economic sectors in the Caribbean, particularly the agriculture and food security, water, disaster risk management and more recently since 2014, the health sector. Going forward, CIMH will expand sector coverage not only to enhance the service delivery to these sectors but also to include the energy and tourism sectors. The goal of this expanded remit is the integration of climate products and services into the decision-making processes of these key socio-economic sectors. To facilitate this engagement, a number of generic and sector specific communication products and materials will be developed and made accessible through the RCC website. As part of this suite of communication products, sector specific webpages with embedded tools and related guidance materials will be developed. There is the need for climate service providers to be able to describe in non-technical terms the existing technologies and climate products (such as their specifications and formats), as well as their limitations (WMO 2014). The CIMH will seek to close this gap by developing product information sheets that inventory and describe products relevant to generic and specific sectoral applications.

² These are the Caribbean Agricultural Research & Development Institute (CARDI); the Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE); the Caribbean Public Health Agency (CARPHA); the Caribbean Disaster Emergency Management Agency (CDEMA); the Caribbean Tourism Organization (CTO); the Caribbean Hotel & Tourism Association (CHTA); and the Caribbean Water and Wastewater Association (CWWA).

Given the emergent status of the use of seasonal climate information by sectoral users, there is a need to increase the number of avenues that facilitate provider and user technical interfaces on this agenda. The number and range of sectoral activities that address the needs of sectoral stakeholders at regional technical meetings such as the CariCOF will be increased. These regional technical sessions will be complemented by a series of regional cross-sectoral and/or sector specific technical webinars, as well as, National Sectoral EWISACTs Workshops that familiarize national sectoral representatives with the Caribbean's programmatic approach to the design, development and delivery of user oriented climate information and importantly, provide an opportunity for discussion of sectoral applications of CIMH's climate information products and services.

In the face of adhoc sectoral relationships between CIMH and sectoral partners, the third gap relates to the need to formalise these relationships in what is envisioned to be the long-term provision of climate services. Letters of Agreement (LoAs) between CMO/CIMH and sector specific regional agencies for formal collaboration of the climate services agenda will be pursued.

Table 3 presents a summary of gaps, proposed outputs, indicators and targets for Outcome Area I.

Table 3. Gaps, Outputs and Indicators per Outcome Area I

| Development of Seasonal Forecasting Capabilities to Apply to Climate-sensitive Sectors | | | | | |
|--|--|--|---|--|---|
| Outcome Area | Gaps | BRCCC Proposal | Outputs | Indicators | Targets |
| I. <i>Established relationships between meteorologists/climatologists/scientists from other sectors and policymakers from across sectors</i> | 1.1 Limited number of sectors (e.g., agriculture and food security, water, disaster risk, health management) in which awareness and use of climate products have been mainstreamed | <ul style="list-style-type: none"> Increase sector coverage and representation of six climate-sensitive sectors, especially of the energy and tourism sectors | 1.1.1 Communication package of generic and sector specific products and materials | <ul style="list-style-type: none"> Number of sector specific webpages developed and accessible on RCC website Number of product information sheets developed Number of infographics developed | <ul style="list-style-type: none"> 4-6 sector specific webpages developed and accessible 10 product information sheets 4-6 general and sector-specific infographics |
| | 1.2 Limited number of technical sectoral interfaces | <ul style="list-style-type: none"> Increase interfaces through technical discussion and presentations at the regional and national levels | 1.2.1 Sector specific technical sessions at regional technical meetings such as the Caribbean Climate Outlook Forum (CariCOF) General Assemblies 2015-2016 1.2.2 A series of regional cross-sectoral and/or sector specific technical webinars 1.2.3 National Sectoral EWISACTs Workshops | <ul style="list-style-type: none"> Number and range of sectoral activities held at CariCOF that address the needs of sectoral stakeholders % change in knowledge level of CariCOF sectoral participants Number of National Sectoral EWISACTs Workshops conducted % change in knowledge level of national sectoral participants | <ul style="list-style-type: none"> Sector specific programming (4-6 sector sessions) by December 2016 30-50% increase in sectoral participants' knowledge of climate information, products and services (based on pre and post knowledge evaluations) 4-6 cross-sectoral and/or sector-specific regional webinars convened 3-5 National Sectoral EWISACTs Workshops convened 30-50% increase in participants' knowledge of climate information, products and services (based on pre versus post knowledge evaluations) |

| Development of Seasonal Forecasting Capabilities to Apply to Climate-sensitive Sectors | | | | | |
|--|-----------------------------------|---|--|---|---|
| Outcome Area | Gaps | BRCCC Proposal | Outputs | Indicators | Targets |
| | 1.3 Ad hoc sectoral relationships | <ul style="list-style-type: none"> Formalise sectoral relationships on the climate services agenda | 1.3.1 LoAs signed between CIMH and sector specific regional agencies for formal collaboration on the climate services agenda | <ul style="list-style-type: none"> Number of LoAs signed | <ul style="list-style-type: none"> 4-6 LoAs signed |

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

Outcome Area II focuses on integrating and/or developing sector specific impact forecasting/prediction models into a Decision Support System (DSS) to support early warning and associated sectoral action. Technical work in this area is presently very embryonic in the Caribbean so the focus on initiating this agenda is appropriate.

Under this Outcome Area, the lack of a standardized DSS that can service multiple sectors is a gap that will be addressed. An investigation will be conducted into the potential of the Caribbean Dewetra platform - a Pan Caribbean, real-time, integrated risk-based data fusion and decision support platform for weather, climate and hydrological information hosted at CIMH - to become a regional standardized DSS for the delivery of climate products and services. The results of this investigation - a Report - will support efforts to integrate existing and planned climate products, as well as, climate-related, environmental and sectoral datasets. The feasibility of ingesting information from other platforms (eg. CARPHA's CARISURV health surveillance system; CTO's MIST; and the CCCCCs Database Management for a Regional Integrated Observing network for Environmental Change in the Wider Caribbean) into the Caribbean Dewetra platform will also be investigated.

The development of sector-specific forecasting models is inherently complex and must be anchored in a robust knowledge of climate thresholds for sectoral operations. Thus, CIMH and its partners will focus efforts on addressing the limited number of sector-specific climate indices for the Caribbean context. Existing sector specific climate indices may be recalibrated for the Caribbean based on an assessment of sector specific climate risk. Alternatively, where appropriate, new climate indices may be developed or co-developed. These climate indices are expected to contribute to impact models and eventually will shape future sector-specific climate product prototypes.

Table 4 presents a summary of gaps, proposed outputs, indicators and targets for Outcome Area II.

Table 4. Gaps, Outputs and Indicators per Outcome Area II

| Development of Seasonal Forecasting Capabilities to Apply to Climate-sensitive Sectors | | | | | |
|---|---|---|---|---|---|
| Outcome Area | Gaps | BRCCC Proposal | Outputs | Indicators | Targets |
| II. <i>Initiation of the development, deployment and platform integration of sector specific forecasting/planning models in the form of early warning systems</i> | 2.1 No standardized DSS to support sectoral EWISACTs | Investigate potential of the Caribbean Dewetra platform to become sectoral EWISACTs DSS | 2.1.1 Report exploring data sharing and integration of sectoral datasets and sectoral DSSs into/with the Caribbean Dewetra platform | • Report developed and shared | • Report shared by email, presentation and available for download from RCC website by December 2016 |
| | 2.2 Limited number of sector specific climate indices and impact models for the Caribbean context | • Develop, co-develop and/or integrate sector specific climate index/indices | 2.2.1 Sector specific climate index/indices developed and/or co-developed | • Number of sector specific climate index/indices developed and/or co-developed | • 3-5 sector specific climate index/indices |

Outcome Area III: Enhanced institutional capacity

Outcome Area III focuses on understanding and addressing the barriers to the production and uptake of climate products and services, while enhancing the ability of regional and national institutions to effectively govern the development of sectoral EWISACTs.

The first gap revolves around the fact that there are insufficient baselines of the user and provider contexts. Since the Caribbean is formally at the start of its process of developing sectoral EWISACTs, a Report baselining user needs and providers' capacity to deliver climate products that satisfy user needs will be developed. Data collection associated with the development of this Report will be supported through the convening of National Sectoral EWISACTs Workshops under Outcome Area I. Data collection opportunities also exist at the CariCOF sessions 2015-2016. In sum, these deliverables will form the basis of the development of a strategic sectoral EWISACTs Plan of Action 2017-2027.

No mechanism that actively encourages significant and genuine user ownership of the sectoral EWISACTs development process currently exists. Yet, ownership is essential for the successful implementation of sectoral EWISACTs and the sustainability of its Outputs. At the regional level, CIMH, in collaboration with its sectoral partners, will establish a user centred mechanism for the short-term (2015-2016) governance of this agenda. The Consortium of Regional Sectoral EWISACTs Coordination Partners represents an integrated, cross-sectoral approach to the development of sectoral EWISACTs that will provide a discussion and action space for regional sector representatives to jointly shape the Outcome Areas of sectoral EWISACTs in collaboration with providers (CIMH 2015). To support cross-sectoral interaction, an online Consortium landing page and associated functionalities will be developed. Through future capacity building efforts beyond the BRCCC Programme, it is expected that the Consortium will transition to shared ownership between climate service providers and sectoral stakeholders in the long-term.

Governance mechanisms are also weak at the national levels. To address this, it is proposed that a centralized National Sectoral EWISACTs Committee (NSEC) be established to coordinate the delivery of sector oriented climate services within each CMO Member State. NSECs are envisioned to be a national, multi-partite committee of providers (represented by the NMHS), and users (represented by the national portfolio Ministry for 6 climate-sensitive sectors, as well as, by private sector Associations, where applicable). NSECs will capitalize on adhoc coordination relationships that may already exist in a few CMO Member States that have convened National Climate Outlook Forums (NCOFs) within recent times. In their role and purpose, NSECs are intended to mirror the Consortium arrangement at the national level. Thus, the members of the NSEC will collaborate on the development and implementation of national sectoral EWISACTs; on the design, development and delivery of tailored national climate products and services in six climate-sensitive sectors; on identifying critical gaps and opportunities for inter-sectoral linkages and synergies at the national level; and on facilitating the visibility of sectoral EWISACTs at the national level. Recognising that capacity levels for national coordination of the delivery of climate services are largely embryonic throughout CMO

Member States, in the short-term, CIMH will serve as a technical Observer organization to the NSEC formation and coordination process.

Table 5 presents a summary of gaps, proposed outputs, indicators and targets for Outcome Area III.

Table 5. Gaps, Outputs and Indicators per Outcome Area III

| Development of Seasonal Forecasting Capabilities to Apply to Climate-sensitive Sectors | | | | | |
|--|--|--|--|--|--|
| Outcome Area | Gaps | BRCCC Proposal | Outputs | Indicators | Targets |
| III. <i>Enhanced institutional capacity</i> | 3.1 Insufficient baselines (re: user needs, provider capacity) to inform product tailoring and development in the short- and long-term | Assessment of user needs and providers' capacity to deliver climate products that satisfy user needs | 3.1.1 Research report baselining users' needs and providers' capacity to deliver climate products that satisfy user needs 3.1.2 Sectoral EWISACTs Plan of Action 2017-2027 | <ul style="list-style-type: none"> • Baseline report developed and shared • Sectoral EWISACTs Plan of Action 2017-2027 developed and adopted | <ul style="list-style-type: none"> • Baseline report shared by email, presentation and available for download from RCC website by December 2016 • Sectoral EWISACTs Plan of Action 2017-2027 shared by email, presentation and available for download from RCC website by December 2016 |
| | 3.2 Lack of governance mechanisms anchored in and driven by sectoral partners and the regional and national contexts | <ul style="list-style-type: none"> • Governance mechanisms formalized and/or mainstreamed at the regional and national levels | 3.2.1 Governance mechanism at the regional level (eg. the Consortium of Regional Sectoral EWISACTs Coordination Partners) 3.2.2 Consortium landing page and associated functionalities 3.2.3 Governance mechanisms at the national level (eg. National Sectoral EWISACTs Committees) | <ul style="list-style-type: none"> • A regional sectoral coordination mechanism established and functioning • An online, cross-sectoral communication interface established • National sectoral coordination mechanisms established and functioning | <ul style="list-style-type: none"> • Regional coordination mechanism with 6 sectoral partners established and functioning by December 2016 • Consortium landing page and associated functionalities (e.g., members only area accessible through login) developed and functional by December 2016 • 1-2 National Sectoral EWISACTs Committees established and functioning by December 2016 |

Outcome Area IV: Enhanced adaptive capacity

Weak linkages between climate information, impacts and concrete action represent a lost opportunity to make forecast information relevant to sectoral decision-makers and increase their capacity to effectively use climate information to adapt. To address this gap, systematic research on the relationship between climate and sectoral productivity, historical climate impacts and sectoral response; and the impact of climate outlooks on sectoral response will be conducted. This Report will seek to correlate past physical and socio-economic impacts associated with past forecasts in order to better understand the link between climate information and expected impacts. This enhanced understanding is expected to contribute to a matching of appropriate response strategies to deal with potential impacts.

A new web-based user interface tool will be designed to enable sector users to link current forecasts to appropriate response strategies. The interface tool and the research that underpins it is likely to enhance sectoral adaptive capacity.

Case study briefs based on the Caribbean experience of integrating climate information into sectoral decision-making processes will be developed and published to tangibly showcase the climate capacity building process and outcomes.

Table 6 presents a summary of gaps, proposed outputs, indicators and targets for Outcome Area IV.

Table 6. Gaps, Outputs and Indicators per Outcome Area IV

| Development of Seasonal Forecasting Capabilities to Apply to Climate-sensitive Sectors | | | | | |
|--|--|---|---|---|--|
| Outcome Area | Gaps | BRCCC Proposal | Outputs | Indicators | Targets |
| IV. <i>Adaptive capacity</i> | 4.1 Weak linkages between climate forecasts, impact and concrete action | <ul style="list-style-type: none"> Systematic research on how climate negatively and/or positively impacts climate-sensitive sectors, as well as, correlation of forecasts to past impacts and appropriate response strategies | 4.1.1 Report on the relationship between climate and sectoral productivity, historical climate impacts and sectoral response; and the impact of climate outlooks on sectoral response | <ul style="list-style-type: none"> Research report developed and shared | <ul style="list-style-type: none"> Research Report shared by email, presentation and available for download from RCC website by December 2016 |
| | | <ul style="list-style-type: none"> Design of web-based user interface tool | 4.1.2 Design of a web-based user interface tool enabling users to correlate forecasts to past impacts and appropriate response strategies | <ul style="list-style-type: none"> # of interface tools designed | <ul style="list-style-type: none"> 1 interface tool designed |
| | 4.2 Little documented evidence of how climate information improves sectoral decision-making in the Caribbean | <ul style="list-style-type: none"> Develop and disseminate case study briefs | 4.2.1 Case study briefs demonstrating how existing climate information has been incorporated into sectoral decision-making | <ul style="list-style-type: none"> Number of case study briefs developed and published | <ul style="list-style-type: none"> 4-6 case study briefs developed and published |

The range of concrete Outputs discussed above represents the Work Plan (2015-2016) for sectoral EWISACTs under the BRCCC Programme.

3.0 Sectoral EWISACTs Implementation Plan

The Work Plan for sectoral EWISACTs will have an implementation span over two years (2015-2016). Where appropriate, activities in support of the development of Outputs will be conducted concurrently. Timelines associated with the implementation of specific Outputs over this period are summarized in Table 7 below.

Table 7. Implementation Plan Timeline

| Outcome Area/Outputs | 2015 | | | | 2016 | | | |
|--|------|----|----|----|------|----|----|----|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| <i>I. Established relationships between meteorologists/climatologists, scientists from other sectors and policymakers from across sectors</i> | | | | | | | | |
| 1.1.1 Communication package of generic and sector specific products and materials | | | ■ | ■ | ■ | ■ | | |
| 1.2.1 Sector specific sessions at regional technical meetings such as the CariCOF General Assemblies 2015-2016 | | | ■ | ■ | ■ | ■ | ■ | ■ |
| 1.2.2 A series of regional cross sectoral and/or sector specific technical webinars | | | | ■ | ■ | ■ | ■ | ■ |
| 1.2.3 National Sectoral EWISACTs Workshops | | | | ■ | ■ | ■ | | |
| 1.3.1 LoAs signed between CIMH and sector specific regional agencies for formal collaboration on the climate services agenda | | | | | ■ | ■ | ■ | ■ |
| <i>II. Initiation of the development, deployment and platform integration of sector specific forecasting/planning models in the form of early warning systems</i> | | | | | | | | |
| 2.1.1 Research report exploring data sharing and integration of sectoral datasets and sectoral DSSs into/with the Caribbean Dewetra platform | | | | | ■ | ■ | | |
| 2.2.1 Sector specific climate index/indices developed and/or co-developed | | | | | ■ | ■ | ■ | ■ |
| <i>III. Enhanced institutional capacity</i> | | | | | | | | |
| 3.1.1 Research report baselining user needs and providers' capacity to deliver climate products that satisfy user needs | | | ■ | ■ | ■ | ■ | ■ | ■ |
| 3.1.2 Sectoral EWISACTs Plan of Action 2017-2027 | | | | | | | ■ | ■ |

| Outcome Area/Outputs | 2015 | | | | 2016 | | | |
|---|------|----|----|----|------|----|----|----|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| 3.2.1 Governance mechanisms at the regional level (e.g., the Consortium of Regional Sectoral EWISACTs Coordination Partners) | | | | | | | | |
| 3.2.2 Consortium landing page and associated functionalities (e.g., members only area accessible through login) | | | | | | | | |
| 3.2.3 Governance mechanisms at the national level (e.g., National Sectoral EWISACTs Committees) | | | | | | | | |
| IV. Enhanced adaptive capacity | | | | | | | | |
| 4.1.1 Report on the relationship between climate and sectoral productivity, historical climate impacts and sectoral response; and the impact of climate outlooks on sectoral response | | | | | | | | |
| 4.1.2 Design of a web-based user interface tool enabling users to correlate forecasts to past impacts and appropriate response strategies | | | | | | | | |
| 4.2.1 Case study briefs demonstrating how existing climate information has been incorporated into sectoral decision-making | | | | | | | | |

4.0 Implementation Risks

While there are risks associated with the development of sectoral EWISACTs (such as the occurrence of a hurricane strike during the annual Atlantic hurricane season which would command the time and resources of the NMHSs and the CIMH, or a change in the leadership or direction of sectoral partners), the implementation risks for the sectoral EWISACTs component of the BRCCC Programme can generally be considered to be low.

Every effort will be made to minimize implementation risk through: 1) the establishment of a core CIMH team with responsibility for the management of the development of sectoral EWISACTs, 2) close collaboration with sectoral partners and their stakeholders, and 3) the development of shared timelines.

5.0 Monitoring, Evaluation and Reporting

The Chief of Section, Applied Meteorology and Climatology (AMC) in collaboration with the Postdoctoral Researchers will monitor the progress of Output development on a day-to-day

operational basis. To facilitate this monitoring, indicators and targets have been developed to measure and track progress associated with each Output.

A review of progress is expected to be conducted by the Consortium in May 2016. Six month Progress Reports will be submitted to Consortium partners and observer organizations in November 2015, May 2016 and November 2016 respectively.

It is also expected that progress on the development of sectoral EWISACTs will be reviewed by the BRCCC Programme Steering Committee (BRCCC PSC) at future annual meetings of that Committee.

A formal third party evaluation of sectoral EWISACTs is envisioned to be conducted as part of the overall assessment of the BRCCC Programme at the end of the Programme.

6.0 Sustainability of Sectoral EWISACTs Outputs beyond the BRCCC Programme

It is important that planned initiatives under Component 4.1, Technical Area III of the BRCCC Programme be integrated with existing and planned activities to ensure, where appropriate, the sustainability of actions. Thus, the CIMH approach capitalizes on synergies across existing and planned initiatives at the strategic and operational levels incorporating opportunities for collaboration to achieve the development of sectoral EWISACTs in several ways.

The involvement of a range of regional institutions responsible for sectoral coordination as key partners represents a sustainability tool. The Consortium is envisioned to be a strategic sectoral oversight and ownership mechanism that supports the implementation of seasonal forecasting capabilities in six climate-sensitive sectors. In some instances, new linkages will be established with regional institutions such as the CTO, the CHTA and the CREE, while in other instances, CIMH and regional sectoral partners like CDEMA will continue to collaborate. Opportunities to promote technology and knowledge transfer and facilitate the sustainability of sectoral EWISACTs Outputs will be identified by Consortium partners and pursued by CIMH where appropriate.

At a strategic level, knowledge regarding the existing national and regional policy framework will be actively incorporated into the sectoral EWISACTs development process to ensure adherence and advancement of already existing agendas such as the *Regional Comprehensive Disaster Management (CDM) Strategy and Programming Framework 2014-2024*. For example, sectoral EWISACTs can specifically advance *Outcome 3: Improved effectiveness of CDM at sectoral levels* on the climate variability timescale. Each of the three Outputs under Outcome 3³

³ These three Outputs are: 3.1. Disaster Risk Management program at the sectoral level improved; 3.2. Hazard information integrated into sectoral development planning and programming; and 3.3. Disaster and climate risk proofing of development programming and investment decision-making at the sectoral level strengthened.

of the CDM Strategy and Programming Framework 2014-2024 will also benefit from the work proposed under this WIP. Sectoral EWISACTs development can also contribute to the ICT and Environmental Sustainability cross-cutting themes of the CDM Strategy and Programming Framework 2014-2024.

There are also other opportunities for joint programming. For example, there is a clear nexus between the plans outlined in this WIP and some aspects of the *“Implementation Plan for the Regional Framework for Achieving Development Resilient to Climate Change 2009-2015* of the CARICOM Climate Change Centre. Specifically, strategic element 2 of the Framework seeks to “Promote the implementation of specific adaptation measures to address key vulnerabilities in the region.” The aim here is to strengthen the climate resilience of the most vulnerable sectors by supporting the dissemination of successful adaptation measures. This harmonises well with the objectives of Outcome Area IV of the sectoral EWISACTs agenda and presents opportunities for collaboration. Of note, the targeted sectors of the Framework include three of the targeted sectors under the BRCCC Programme of EWISACTs, these being water, tourism, and health.

In addition, the Medium-Term Plan (2014-2016) of the Caribbean Agricultural Research & Development Institute (CARDI) has elements that will directly and indirectly complement objectives outlined under Outcome Areas III (Enhanced Institutional Capacity) and IV (Enhanced Adaptive Capacity). In this regard, the CARDI Plan has under *“Strategic Axis 2- Development of Strategic Linkages”* initiatives to strengthen partnerships between CARDI and relevant national, regional (and international) agencies with a common interest in (sectoral) agricultural research and development. This has the potential to strengthen CARDI’s role as the Consortium partner for agriculture. Further, *“Strategic Axis 1- Development of Sustainable Industries”* includes a sub-section specifically devoted to *“agriculture and climate change.”* This seeks to enhance knowledge of climate change factors and sectoral impacts. Accordingly, the objectives of Outcome Area IV could be advanced with the provision of useful sector specific products and services, as well as, case studies of how the use of climate information improves decision-making. Similar opportunities also exist with the Strategic Plan (2015-2018) of the CWWA.

Recognising the long-term approach needed for implementation of the GFCS, CIMH will investigate the potential of the development of a consensus-based 10-15 year strategic vision for climate services in the Caribbean. The need for such a framework is demonstrated by the complexity of climate science and the embryonic status of its application to climate-sensitive sectors in the Caribbean.

Moreover, CIMH in collaboration with its regional and international partners will continue to provide leadership and guidance to the longer term implementation of the GFCS which would ensure the sustainability of the deliverables of the USAID supported BRCCC Programme.

At the operational level, CIMH will fully integrate the sectoral EWISACTs development process into its annual work plan and the biannual CariCOF process thus ensuring that the Outputs produced under Component 4.1, Technical Area III, endure beyond the BRCCC Programme.

Outputs will remain the responsibility of CIMH and the NMHSs for continued orientation and use through the AMC Section of the CIMH. In most cases, sectoral EWISACTs Outputs will be available through the CIMH Library. Sector specific webpages with embedded tools and related guidance materials will be integrated into the CIMH RCC website and will be managed and maintained as part of the AMC and IT Unit's routine functions.

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