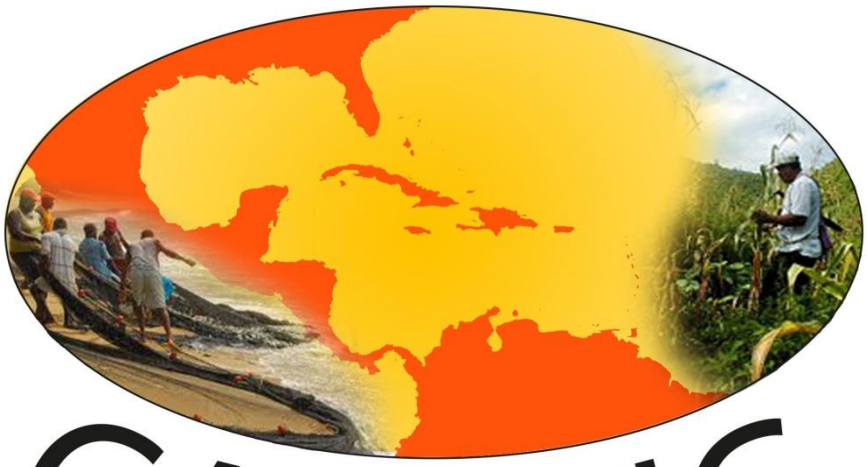
Caribbean Weather Impacts Group
Supporting risk based decision making



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Deliverable KD1.2 1

Policy Context Report

Ottis Joslyn and Keith Nichols
Caribbean Community Climate Change Centre

Stakeholder Workshop, February 6-7, 2013
Kingston, Jamaica

A deliverable of
T1.2. Understanding the regional policy context through a stakeholder workshop
of
Workpackage 1. Stakeholder requirements for regional climate information in support of climate compatible development

Contents

1. Summary of deliverable

This deliverable reports the policy context of Caribbean regional-scale stakeholders with regards to the services and tools proposed by the CARIWIG project. Together with the report on stakeholder requirements (KD2.2.1; Goodess et al., 2013) these deliverables form a pair of complementary reports of the outcomes of the first CARIWIG stakeholder workshop held in Kingston Jamaica 6-7 February 2013.

Regional stakeholders (see the Appendix) were brought together to discuss the tools and services that the CARIWIG project will deliver. These tools and services are important for the region because they will assist policymakers, managers and decision makers to make informed decisions both regionally and nationally. The stakeholders were selected because the institutions that they represent play major roles in how policies are designed regionally and nationally especially in the agriculture, health, water resources, coastal and marine sectors. It was therefore important for the views of these institutions to steer the CARIWIG project so that the tools and services that will be offered to the Governments across the region are developed to provide appropriate data, scientific information, analysis and policy guidelines for key socio-economic sectors.

1.1 The CARIWIG project

Managers and policy makers in the Caribbean require knowledge of climate impacts and hazards that are specific to their geographical location and climate, and that are relevant to their planning time-horizons. However, current climate model projections are limited, lack the resolution needed for resource management and exhibit biases with respect to the local climate. Sophisticated downscaling providing locally relevant unbiased climate change information remains sporadic. Further the utilisation of these projections for management purposes is constrained by a considerable knowledge deficit.

More reliable and useful climate information can be provided using new technologies. As is briefly summarized by Chen et al. (2008) different approaches have been used within the Caribbean Community countries to develop climate change scenarios. These approaches range from the use of General Circulation Model (GCM) output (Centella et al., 1999) to more sophisticated downscaling (Chen et al., 2006) using SDSM software (Wilby et al., 2002). Recently there has been increased use of Regional Climate Models (RCMs) throughout the Caribbean (Taylor et al., 2007 and Centella et al., 2008) producing larger volumes of climate model output data at finer spatial scales which are available for researchers and policymakers in the region. Helpfully, the Caribbean and Central America has been designated as a region within the CORDEX initiative for RCM simulations and inter-comparisons. However, this is unlikely to produce a significant increase in RCM output until about 2015.

This emergent science is highly necessary, but due to the high-cost of long simulations of RCMs and the very small number of model runs available, data

quantity and quality (due to significant bias, Taylor *et al*, 2007) are still perilously low compared to other regions (such as Europe and North America). State-of-the-art web-based technologies incorporating weather generators (WGs) such as the UKCIP/EARWIG systems will be adapted to the Caribbean following appropriate research. These WGs allow many critical factors to be addressed, including:

- correction of climate model biases;
- representation of natural climatic variability using a stochastic model component;
- inclusion of extremes (hurricanes) which cannot be modelled by RCMs directly

The CARIWIG project addresses these issues for policy makers and managers of regional institutions through the provision of a web-based service to provide unbiased locally relevant weather scenarios for the present day, the short term (e.g. 2030s) and the longer term (e.g. 2080s). This will be achieved through adaptation of leading stochastic weather-generator technology, from the EARWIG (Kilsby et al., 2008) and the UKCIP09 (Jones et al., 2009) climate knowledge systems.

1.2 Context of this deliverable

Key regional stakeholders were identified and facilitated to attend the first stakeholder workshop. At the workshop the project aims were disseminated and a dialogue developed to determine the regional decision making context and to understand developmental needs. Additionally, potential case study partnerships were identified and discussed. This deliverable reports on the regional decision making context and provides a list of potential case studies. These will be evaluated and initiated to maximize the benefit of the web based service for regional impact studies. A further outcome from the stakeholder dialogue was a technical evaluation of the services under development in the CARIWIG project. This is summarized in the report on stakeholder requirements (KD2.2.1; Goodess et al., 2013).

2. Aims and Objectives of the First Workshop

The aims and objectives of the regional stakeholders' workshop were based not only on the deliverables of the CARIWIG project, but also on the overall mandate of the Caribbean Community Climate Change Centre (CCCCC) which is to coordinate the regional response to climate change in the region's efforts to manage and adapt to its projected impacts. In addition to this, the CCCCC has a mandate to provide climate change related policy advice for the Caribbean Community Member States especially as managers and policy makers within the region require knowledge of climate impacts and hazards specific to each geographical location and climate, and relevant to each planning time horizon.

Knowledge and information gaps were also identified and the tools and services that the CARIWIG project will provide will contribute to the process of filling some of these gaps. This will be achieved by building regional capacity in climate-compatible development, and developing research networks and regional support networks between stakeholder institutions both regionally and internationally.

Therefore, to begin addressing some of the gaps the main aims and objectives of the workshop were articulated as follows:

- To inform senior level stakeholders of the aims and objectives of the CARIWIG project;
- To introduce the CARIWIG weather generator and other tools (for many applications, users need a continuous time stream of weather data, typically to be used as input to a computer model of some process of interest, such as water or wind erosion. A weather generator is a statistical model that can be used for this purpose;
- To demonstrate the utility of the CARIWIG tools and services;
- To foster ownership among stakeholders.
- To establish the north-south research collaboration framework.
- To formulate a sustainability approach for post-project activities.

Further details of the workshop's structure, methodology and outcomes may be found in Goodess et al. (2013).

Preliminary seminar introducing the tools and services of the project.

3. Evaluation of the CARIWIG tools and services

This section provides a summary of the regional policy perspective of the particular tools and web services proposed by the CARIWIG project. The tools and services are the Regional Climate Models, tropical storm modelling, weather generators and the web service.

3.1. Regional Climate Model

A Regional Climate Model (RCM) is a high resolution climate model that covers a limited area of the globe, typically 5,000 km x 5,000 km and 2500 km x 2500 km. RCMs are based on physical laws represented by mathematical equations that are solved using a three-dimensional grid. The typical horizontal resolution of an RCM is 50 km.

Stakeholders raised various concerns about the existing regional climate model projections:

- Problems associated with Caribbean meteorological datasets and the need for some sort of infill for missing meteorological datasets;
- Current difficulties in validating RCMs in the Eastern Caribbean;
- The need for high resolution models for the smaller islands such as St. Lucia, St. Vincent and the Grenadines, Grenada and her sister islands, Barbados;
- The requirement for in depth assessment of quality/reliability of information before using for impacts modelling;
- Urgent need for quantitative information for climate impact assessments as the region cannot just rely on qualitative information;
- Whilst the tropical storm model will provide information along the track of the storm, there is the need for a broader provision of information.

Some important considerations on the regional climate model emerging from the workshop suggest that:

- Data generated by the model can be used as input to other specific models, including the weather generator [model];
- Spatial differences of certain climate parameters across regions can be deduced and comparative analysis conducted;
- Currently the model produces data at 50km and 25km resolutions. This could be improved or downscaled to 9km and 3km;
- There are some issues with the reliability of the RCM which need to be addressed;
- Uncertainty cascades down – so how high a resolution can be meaningful to the Wider Caribbean region?
- There is a need for more discussion and the determination of solutions for the spatial limitations of RCMs

3.2. Tropical Storm Modelling

The following reflects the thoughts expressed and issues raised by regional stakeholders:

- The model is still in developmental/embryonic stage and it is not clear how it will be applied to respective sectors e.g. agriculture, health, water resources. Hence there is a need to understand better how it can be applied. This is an area where engagement with stakeholders could be a key element of making a success of the project.
- The potential overall usefulness and need of the tool/model was noted;
- Reiterated that tracks and the characteristics of storms will be produced;
- It was agreed that all four variables (rainfall, wind speed, wind direction, and storm surges) are extremely important;
- It is strongly recommended that "speed of the tropical storm" be included as one of the model outputs;
- A significant query was /"how can users collaborate to drive policy changes?"
- Creating awareness of the existence and utility of the completed tool is required to promote its sustainability;
- It is important to deliver proper training in the use of this tool;
- Is it a useful tool for modelling/understanding the following:
  Maximum winds
  Landfall rates
  Frequency of development
  Rainfall amounts
- Data and information on rainfall/precipitation is extremely significant for national governments and for regional interventions especially with regard to quality and quantity of rainfall (rainfall rate per hour – rainfall intensity), climate variability and climate extremes;
- The significant aspects/outputs of the model that must be addressed include rate of changes per hour and transitional speed of the tropical storm;
- It is highly significant for coastal zone management and needs to incorporate storm surge modelling and sea level rise scenarios – at least in future;
- There are already some agencies working in this area (storm surge modelling and sea level rise scenarios) highlighting the need for collaboration;
- It is highly likely that the range of developmental sectors to which the Weather Generator could be applied is limitless, with the appropriate level of customisation
- Information needs to be translated for various end users especially in the context of influencing policy and decisions;
- Hourly resolution for rainfall would be appreciated;
- It is unclear how the weather generator will treat the length of time tropical storm or cyclone remains over a particular area especially with regard to precipitation and wind impact.

3.3. Weather Generator

The following reflect the issues raised by regional stakeholders:

- The usefulness of any model depends on the quality of data fed into the model and as such there is the need to know that the RCM (PRECIS) is representing appropriate expected/projected changes;
- Builds statistics based on inputs including RCMs;
- Benefits of downscaled information, but usefulness depends on quality of information and thus needs validation of combined RCM/WG system;
- It is not the politicians who design policy – it is us (scientists and technocrats) who need to influence it;
- Main limitations (size, economies of scale, etc.) in the Caribbean – small islands are still not well represented by the GCMs and RCMs;
- Dangers of looking at single grid points as offered by the WG, spatial analysis not possible[1];
- There is a need for training in order for stakeholders to feel comfortable using tools;
- There is a need for data rescue;
- A significant project risk is the possible scarcity of human resources for Impact modelling;
- How useful will be the WG to water agency/water resources sector?
- Required data from all parts of island – observational weather records for 30 or so years;
- Basic weather data for rainfall & temperature (daily and/or monthly) for a minimum of 20 years will be useful for predicting water resource availability.

The stakeholders outlined some areas for improvement such as:

- A need for increased access to existing data sets/sites;
- Consider data from other agencies (as input to model) – agriculture, water management, etc.
- Data is needed from all parts of the region/all the islands;
- Data for several years is required in order to get reliable information for decision making, especially rainfall data.
- A need to better determine what is available and use data from existing agencies, not only the meteorological offices, but other Ministries such as Agriculture, Health, etc. who may hold rainfall information for other purposes, e.g. agricultural crop producers;
- Data and information by sectors are missing/not available;
- Observed data are missing.

[1] Clarification: note that spatial in the context of this comment refer to scales greater than say 25 km or outside a zone of uniform climate, since a point observation or simulation does represent the weather in the area surrounding it.

3.4. Web Service

The stakeholders' thoughts on the web based service to be offered for the CARIWIG tools included:

- It is a good idea to have such service, but there is a need to be aware of other existing resources and what else is being done in the region;
- It will be good to have information in standard formats;
- The tool(s) must cater to the wide range of different types of users – from those needing lots of data to those who will need just a nice simple graphical representation; therefore, the developers of the tool(s) must recognise different levels and needs of users;
- The danger exists that some persons may misuse the data/information and as such there is a need for a capacity building framework to avoid this;
- Want a flexible service e.g., to incorporate a different RCM;
- Recommended functionalities for the website include:
  Time series for the region, country, point, station, etc. to be available;
  All the models should be merged and included on the web portal platform;
  Ability to query location and determine what information is available;

- Noted that historic data are already available at the CIMH;
- Recognise and address gaps between weather generator outputs and translating to non-scientific users eg. Farmers, policy makers; public, some students, consultants, some technocrats;
- How will the information be packaged? Should it be sector specific or otherwise?
- Technical functionality, especially with regards to application to case studies;
- Simulated rainfall information for future decision-making;
- Needs to be a comprehensive service e.g., including storm surge and SLR;
- Consultants/academics/technocrats should be able to access information that can then be used to influence policy;
- Need to link science and agencies in Member countries – otherwise science is not meaningful;
- Need for transmission at local/community level.
- The overall thought was that all services were useful for region – but needs are different along user chain from government to more local stakeholders
- Currently there is not much use of similar services in the region because of unfamiliarity
- It must be related to policy cycle for sector (e.g., fisheries management plan) because there will be different information needs through that policy cycle and therefore will need agreement on information need to meet this cycle.

3.5. Risk Management Framework

The development of the Caribbean Climate Risk Management Framework and its associated Caribbean Climate Online Risk and Adaptation TooL (CCORAL) is a direct response to one of the actions defined in the Regional Framework for Achieving Development Resilient to Climate Change (the "Regional Framework").

This Regional Framework and the landmark Implementation Plan (IP) were endorsed by CARICOM Heads of Government in 2009 and 2012, respectively.

Climate risk management tools, such as CCORAL, are crucial elements of the region's emerging strong early action framework for building climate resilience and aiding in defining approaches and solutions that have net benefits now and in the future – 'no-regret' actions and flexible solutions.

The Risk Management Tool provides an important complementary service to applications of the CARIWIG tools, enabling climate smart development by embedding a risk management ethic in decision-making.

4. Areas for Policy Development and Enhancement

Based on the feedback from regional stakeholders at the first stakeholders' workshop, on the proposed tools of the CARIWIG project, and the overall policy mandate of the Caribbean Community Climate Change Centre (CCCCC) as it relates to addressing the adverse impacts of climate change, climate variability and extremes, the following are potential policy interventions for the Wider Caribbean Region that can be implemented regionally, nationally and at the community level.

- Translation of technical information for absorption by policy makers and this must be shaped with key messages or sound bites;
- The Case studies selected will be useful to demonstrate the use, impact and benefits of the tool(s) thus providing the scientific basis for decision-making and policy interventions;
- Capacity building and continued training so as to build resilience and develop resources especially in impacts modelling;
- Efforts and work must continue in resolution improvement (from 25 KM to 3 KM) for Small Island States to support scientific documentation and inform adaptation strategies and decision making;
- Development of a tropical storm model that is not only applicable nationally, but brings the most robust benefits to the most productive sectors of the Caribbean Territories;
- The tools to be made available under the CARIWIG project will be most valuable in informing building codes and guidelines, land use management practices and similar sustainable development issues.;
- Rainfall amounts and maximum winds are very useful for the utility sector;
- Fashion insurance programmes for the agriculture sector;
- Note that data and information on wind speed and rainfall intensity and quantity generated from the tropical storm model and WG would be useful information for determining damage to crops from wind and floods. These can inform projected impacts to the agriculture sector to guide the development of mitigation measures.

- By conducting case studies on Agriculture, Coastal development, etc. information will be generated that are extremely useful to formulate mitigation strategies for the built environment on the coast (as each of the small island developing states (SIDS) is a coastal community) and useful for resource management – e.g., insurance, adaptation and mitigation – implications of policy, physical planning, building codes, input to economic modelling (storms, GDP effects).
- Can be used to build resilience into construction works based on projections;
- Provides the level of detail necessary to help support projects in all different areas of the agriculture sector e.g. Infrastructure, marketing, flooding resilience, etc.
- Helps the relevant sectors to define priorities for deploying financial and human resources;
- In general, all models presented are important for informing public policy;
- Accept the technical and societal uncertainties as a precautionary step in developmental planning;
- Policy work is ongoing at regional level but not being translated at local level audience comment: “policy downscaling tool“.

It is important to note that the Caribbean Community Climate Change Centre already has a regional policy context to implement adaptation and mitigation programs for the Wider Caribbean Region known as – *Climate Change and the Caribbean: A Regional Strategy for Achieving Development Resilient to Climate Change (2009-2015)*. It is through this regional strategy and its Implementation Plan that the areas for policy enhancement and development outlined above are articulated. Moreover the Strategic Elements and accompanying Goals of the Implementation Plan provide in greater detail the policy context and actions to be pursued in support of initiatives such as the CARIWIG project.

The sectors and tools identified for research, development and intervention under the CARIWIG project were selected due to their importance and significance within the regional context of climate change. This basically outlines that the rising sea levels with associated coastal erosion, salt water intrusion, inclusive of escalation in the frequency and intensity of tropical storms and hurricanes, disruptions in rainfall and freshwater supply threaten the very existence of the Small Island and low-lying Coastal States of the Caribbean.

In addition and according to the regional framework, the report of the Lancet Commission (2008) identified climate change as the biggest global health threat of the 21st century. Therefore, it is envisioned that the services that will be provided upon the successful implementation of the CARIWIG project will go a long way to informing policies both nationally and regionally to address these adverse effects to climate change ultimately contributing to building resilience to the impacts of climate change and climate resilience throughout the region.

The CARIWIG project and the services that will be made available upon its implementation are guided by the regional policy framework by reflecting three of the five strategic objectives of the regional framework; namely:

- *"Promoting the development and implementation of educational and public awareness programmes as well as public access to information and citizen participation across the Caribbean region;"*
- *"Building the Caribbean Community Climate Change Centre's organisational capacity to manage adaptation to climate change, through training of scientific, technical, and managerial personnel; institutional strengthening; providing systematic long-term technical assistance; and strengthening information support capacity that allows the CCCCC to effectively support the Member states;"*
- *"Promoting the dissemination of successful adaptation experiences to address the impacts of climate change on: (a) water supply; (b) coastal and marine ecosystems; (c) tourism; (d) coastal infrastructure; and (e) health, which combined represent the largest threats to the well-being of the CARICOM countries."*

5. Proposed Case Studies

The objectives of the case studies are:

- To provide a real-world testing ground and demonstration platform for the CARIWIG tools;
- To enhance the utility of the CARIWIG tools for regional decision makers;
- To demonstrate the value of the CARIWIG tools for regional decision makers;
- To build capacity in the region through 'training the trainers.'

A set of case study selection criteria were proposed. by the project partners.

- They should relate to key economic sectors:
  - a country's priority economic / socio-economic sector, or a priority ecosystem and its processes;
  - a significant/important economic contributor to national GDP, high social significance (e.g. health sector);
  - or play a major role in sustainable economic growth inclusive of the provision of livelihood opportunities.

- They should focus on areas (sectors, locations) with high vulnerability and risk associated with climate change:
  - likely severe/significant adverse effects of climate, climate variability and climate change;
  - or severe and adversely impacted by anthropogenic actions.

- They should include low income countries:
  - adaptation and mitigation strategies and actions promotes poverty alleviation.

- They should be undertaken in conjunction with regional stakeholders:
    - require a primary stakeholders consensus;
    - countries based case studies need to have capacity and resources to fully and actively participate.

- They should contribute to capacity building within the region using CARIWIG tools:
    - ability to significantly benefit from the application of the CARIWIG weather generator, and other climate modelling, vulnerability and risk assessment tools and methodologies is required;
    - selected studies should have the potential to become the most robust studies and provide the most benefits to stakeholders;
    - they may include selected new studies and enhancements to specific studies already carried out that are priorities and primary economic contributors at the community, national and regional levels.

- They should be realistic and achievable in terms of the availability of observed and simulated climate data from CARIWIG and other available resources.

All participants agreed to the proposed selection criteria for the case studies. The participants identified several case study opportunities recognising the potential for linking with ongoing or planned activities under the CCCCC EU funded GCCA project. Areas covered by the case studies proposed by the participants include agriculture, water resources, health, coastal areas/zone and comprehensive data management. It was stressed that integrated assessments be incorporated as much as possible in conducting the case studies.

The workshop team explained that the financing for the case studies was limited requiring meaningful support from the regional agencies represented. The long list of potential case studies emerging from the groups highlighted not only the interest of stakeholders but also the vision of the broad based application desired by all. Recognising that financing is limited, attempts will be made to best take account of the entire list.

One option presented for financing the expanded list was to use existing activities and projects to test the application of the generator. This was exemplified in a suggestion that agencies represented should be willing to co-finance additional case study applications of the tool beyond those targeted by the project. This was readily agreed to by all participants.

One suggestion emerging from the stakeholders was that the tool should eventually be customized to satisfy all decision-making levels from the regional to national and then eventually to the community level and as such additional resources should be mobilised to allow for the total penetration at all societal and developmental levels.

The reviews from all the participants were very positive, with a general agreement to remain engaged as willing contributors to the development of the CARIWIG tools throughout the project life. One issue raised related to the sustainability of the application of the tools beyond the project life, in effect mainstreaming the use of the tool as a decision-support aid. All participants readily agreed that this is key and that the appropriate architecture should be developed to ensure uptake and integration into decision-support not only within the public sector, but at all levels in the region and in country.

Case study recommendations by the participants were prepared from both a sector-specific and a cross-cutting perspective. Three sectors were considered: water resources; coastal zone management; agriculture, fisheries and food security. The following sections summarize the recommended case studies by perspective.

Water Resources Sector

- Following the impact of Hurricane Tomas on the water resources sector in St. Lucia, it is important to consider the provision of information on the impact of climate change on the reservoirs in St. Lucia or any other Caribbean Country. Such an analysis could include issues of sustainability, policy issues, impact on communities and livelihoods, impact on water availability and quality;
- Impact of climate change on coastal flooding and the associated risks involved: e.g. the west coast of Barbados and/or Nevis (OECS case study available to inform the Nevis situation);
- Impact of sea level rise on coastal aquifers: modelling of sea level on coastal aquifer in southern Clarendon (WRA); saline water intrusion in St. Kitts (OECS);
- Caribbean drought during 2009 - 2010;
- Case study on distribution of climate data collection stations - Jamaica.

Coastal Zone Management

- Landslides and erosion trends in coastal villages in Belize due to increased rainfall;
- Sediment transport from rivers due to increased rainfall in Saint Lucia and the effects of sediment mining;
- Coastal flooding in the Holetown area and the impacts of increased or reduced rainfall trends due to Climate Change.

Agriculture, Fisheries and Food Security

- Climate, climate variability and climate change impacts on subsistence farming;
- Climate, climate variability and climate change impacts on pelagic fishery in SIDS (rural communities' livelihoods) and continental fishery in Guyana;
- Governance and the institutional arrangements in food production, inclusive of the fisheries sector with regards to the impacts of climate, climate variability and climate change.

Cross Cutting Sector

- Climate change impacts on sweet potato in Grenada: in particular with regard to the health of communities and the nation; plant growth; pests and diseases; transport and storage; value added processes; new uses; importance across the region; and nutritional benefits.
- Health issues with regards to disease transmission vectors and climate. For example, the hazards of dengue and malaria with respect to climate, climate variability and climate change in Haiti and the interactions with preventative measures (e.g. education, better treatment to stop spread, sterile males, early warning systems, etc.).

Focus group discussion of the tools and services of the project

Participants expressed a keen interest in getting involved in case studies especially those that are regional in nature such as the Drought in the Caribbean (work currently being done by INSMET in Cuba). Also, work on the fisheries sector is strongly being requested. It was noted that certain case studies may benefit considerably from ongoing and planned work of the CCCCC.

6. Conclusions

Participants were of the view that the workshop was successful in achieving all of the stated aims, to:

1. Inform senior level stakeholders of the aims and objectives of the CARIWIG project;
2. Introduce the CARIWIG weather generator and other tools;
3. Demonstrate the utility of the tools;
4. Foster ownership among stakeholders;
5. Establish the north-south research collaboration framework;
6. Formulate a sustainability approach for post-project activities.

The attainment of these aims is best reflected by participants expressing the need to keep engaged with the project beyond the first stakeholder workshop and also post-project, all reflecting on the numerous modalities for maintaining high level contact

and communications. This is necessary to ensure a smooth integration into sectoral processes, particularly economic and social, and to achieve maximum benefit from the project at the broad national developmental level. According to one participant the Weather Generator "needs to be part and parcel of various institutional structures that have been set up for different sectors, otherwise climate change is too abstract." Customisation will be necessary however to achieve that goal.

This begs the need for a reorientation of the way data is viewed to support decision-making at policy levels, in particular customising the data from academic and research language to suit the needs of target groups such as farmers, water resources managers and hoteliers. This of course will require training the target groups to use the tools and to empower them to make their own informed decisions, but the learning process must include a feedback mechanism to suggest improvements to the tool. All this however must be supported by the appropriate policy orientation, an important consideration for long term sustainability. It was largely agreed that the appropriate data management protocols at the national and regional levels must be in place to support the broad spectrum of use of the weather generator.

The long wish list of project case studies emphasises the perceived importance of the generator and the broad relevance of its application. This high expectation is a reflection of the level of regional ownership of the instrument and its application, the level of importance placed on the tool and the utility in guiding climate sensitive sectors. The suggestion that other modalities for treating with all these case studies should involve other national and regional project activities are a reflection of the importance placed on understanding how the Weather Generator could be applied to other sectors. The implication here is that these exercises should not be sequential as funding becomes available but run as parallel exercises within the constraints and limitations of financing sources.

To conclude, the project has exceeded participant and workshop organiser expectations and is well poised to provide a meaningful product for use within the region. The broader applications as articulated by participants will be based on the ability of the project in its current configuration to leverage the additional resources to satisfy the entire range of participant expectations.

Appendix: Regional Stakeholders in Attendance

Name	Representing	Country
Avril Alexander	Global Water Partnership-Caribbean (GWP-C)	Trinidad
Victor Poyotte	Caribbean Water and Sewerage Association Inc. (CAWASA)	St Lucia
Ms. Patricia Aquing	Caribbean Environmental Health Institute (CEHI)	St Lucia
Susanna Scott	Organisation of Eastern Caribbean States Commission (OECS)	St Lucia
Dr. Susan Singh-Renton	Caribbean Regional Fisheries Mechanism (CRFM)	St. Vincent and the Grenadines
Saudia Rahat	Caribbean Disaster Emergency Management Agency (CDEMA)	Barbados
Marvin Boyce	Coastal Zone Management Unit (CZMU)	Barbados
Mr. Vincent Gillett	Coastal Zone Management Authority & Institute (CZMAI)	Belize
Keith Nichols	Caribbean Community Climate Change Centre (CCCCC)	Belize
Tyrone Hall	Caribbean Community Climate Change Centre (CCCCC)	Belize
Ottis Joslyn	Caribbean Community Climate Change Centre (CCCCC)	Belize
Timo Baur	Caribbean Community Climate Change Centre (CCCCC)	Belize
Arnoldo Bezanilla	Institute of Meteorology in Cuba (INSMET)	Cuba
Humberto Gomez	Inter American Institute for Cooperation in Agriculture (IICA)	Trinidad
Nigel Durrant	Caribbean Community Secretariat (CARISEC)	Guyana
Manuel Pereira	Caribbean Desalination Association (CaribDA)	Curacao
Rupert Lay	Organisation of Eastern Caribbean States Commission (OECS)	St. Lucia
Cedric Van Meerbeeck	Caribbean Institute of Meteorology and Hydrology (CIMH)	Barbados
Shawn Boyce	Caribbean Institute of Meteorology and Hydrology (CIMH)	Barbados
Leslie Simpson	Caribbean Agricultural Research and Development Institute (CARDI)	Jamaica
Tina Williams	Caribbean Catastrophic Risk Insurance Facility (CCRIF)	Jamaica
Mr. Herbert Thomas	Water Resources Authority	Jamaica
Mr. Hopeton Peterson	Planning Institute of Jamaica	Jamaica
Mr. Ignatius Jean	Inter American Institute for Cooperation in Agriculture (IICA)	Jamaica
Dr. Michael Taylor	University of the West Indies (UWI)	Jamaica
Jayaka Campbell	University of the West Indies (UWI)	Jamaica
Tannecia Stephenson	University of the West Indies (UWI)	Jamaica
Aidan Burton	University of Newcastle (NCL)	UK
Phil James	University of Newcastle (NCL)	UK
Neil Harris	University of Newcastle (NCL)	UK
Clare Goodess	University of East Anglia (UEA)	UK
Phil Jones	University of East Anglia (UEA)	UK
Colin Harpham	University of East Anglia (UEA)	UK
Franklin Mc Donald	Caribbean Natural Resources Institute (CANARI)	Jamaica
Jhordanne Jones	University of the West Indies (UWI)	Jamaica
Jodian Aris	Planning Institute of Jamaica	Jamaica
Tracy-Ann Hyman	University of the West Indies (UWI)	Jamaica
Winston Shaw	National Irrigation Commission Ltd.	Jamaica
Stanley Rampair	National Irrigation Commission Ltd.	Jamaica
Geoffrey Marshall	Water Resources Authority	Jamaica

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