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**GCOS IMPLEMENTATION IN  
CENTRAL AMERICA, MEXICO, AND THE CARIBBEAN**

**Report of the GCOS – CCCCC Implementation Strategy Meeting**

**Belize City, Belize, 28-30 January 2008**

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## TABLE OF CONTENTS

Executive Summary .....	1
Introduction .....	5
Background to the Meeting .....	5
The Goals of the Meeting .....	7
Session I: Opening and Overview .....	7
Session II: Regional Climate Coordination Mechanisms.....	10
Session III: Review of Donor Organization Activities and Priorities.....	12
Session IV: Examples of Regional Climate Activities .....	16
Session V: CAC Project Proposals for Climate Observations .....	17
Session VI: Next Steps for All Participants.....	19
Conclusions of the Meeting.....	21
Appendix 1: Agenda .....	23
Appendix 2: Participants.....	27
Appendix 3: Opening Address by Mr. Carlos Fuller.....	31
Appendix 4: Opening Address by the Honorable Florencio Marin .....	33
Appendix 5: Opening Address by Dr. John Zillman.....	35
Appendix 6: Executive Summary of “A GCOS Regional Action Plan for Central America and the Caribbean” (May 2003) .....	37
Appendix 7: Steve Pollonais: An Analysis of the GCOS Action Plan in the CAC Region and Its Intended Impacts) .....	41
Appendix 8: Proposal: The Provision of Additional and Better Upper Air Observations to Climatological Centers.....	47
Appendix 9: Proposal: Adapting to Climate Change: Raising Awareness in Central America and the Caribbean.....	53
Appendix 10: Proposal: Creating and Sustaining a Regional Technical Support Center.....	59
Appendix 11: Project Brief: Improving Access to Climate Data in the Region.....	65
Appendix 12: Proposal: An IOCARIBE-GOOS – GCOS Partnership to Support a Multi-Use Sea Level Observation Network for the Caribbean Region .....	69
Appendix 13: Draft Terms of Reference for a Global Climate Observing System (GCOS) Regional Coordinator for Central America and the Caribbean.....	75
Appendix 14: Press Release: Belize Hosts Climate Observation Meeting.....	77

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# **GCOS IMPLEMENTATION IN CENTRAL AMERICA, MEXICO, AND THE CARIBBEAN**

## **Report of the GCOS – CCCCC Implementation Strategy Meeting**

**Belize City, Belize**

**28-30 January 2008**

### **EXECUTIVE SUMMARY**

A meeting took place in Belize City, on 28-30 January 2008, to develop a road map for furthering the implementation of the Global Climate Observing System (GCOS)<sup>1</sup> Regional Action Plan (RAP) for Central America and the Caribbean (CAC). The meeting was co-sponsored by the GCOS Secretariat and the Caribbean Community Climate Change Centre (CCCCC) with participation by some 25 representatives of regional climate organisations, funding agencies, and countries with a commitment to improved climate observations in the CAC region and Mexico.

The meeting was opened on behalf of the Belize Minister of Natural Resources and the Environment and addressed by the Chairman of the GCOS Steering Committee and the Executive Director of the CCCCC. The participants recognised the fundamental importance of reliable, comprehensive climate observations to essentially all aspects of the regional and national strategies for addressing the climate issue including managing the impacts of natural climate variability and adapting to human-induced climate change.

The meeting reviewed the state of climate observing networks in the region against the background of the global 'Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC'<sup>2</sup> and the May 2003 Regional Action Plan for GCOS implementation in the CAC region. While limited progress has been made through external assistance and a number of initiatives within the region, some observing networks have deteriorated, and there is now an urgent need for leadership, coordination and enhanced support for implementation action if the wide ranging needs for observational data are to be met over the coming decades. It was recognised that the existing atmospheric, oceanic, and terrestrial observing networks operated by the National Meteorological Services (NMSs) and other institutions of Member countries as part of WMO, IOC, UNEP and ICSU programs constitute the foundation for GCOS in the region but that there are also many other purpose-specific observing initiatives underway as part of national, bilateral, and multilateral climate initiatives which must be fully integrated into CAC-GCOS.

The meeting was briefed on the observation-related activities of a number of regional climate coordination mechanisms including:

- Sistema de la Integración Centroamericana (SICA);
- Secretariat of the Caribbean Community (CARICOM);
- Caribbean Meteorological Organization (CMO);
- Caribbean Institute for Meteorology and Hydrology (CIMH);
- Water Centre for Humid Tropics of Latin America and Caribbean (CATHALAC);

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<sup>1</sup> GCOS is sponsored by the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the United Nations Environment Programme (UNEP), and the International Council for Science (ICSU).

<sup>2</sup> Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC, October, 2004. GCOS-92.

- Intergovernmental Oceanographic Commission Sub-Commission for the Caribbean (IOCARIBE); and
- Caribbean Community Climate Change Centre (CCCCC).

The meeting was also briefed on observation-related activities and priorities of a number of sponsor, donor, and partner organisations including the:

- World Meteorological Organization (WMO);
- Government of Canada;
- US National Oceanic and Atmospheric Administration (NOAA);
- Government of Italy;
- Organization of American States (OAS);
- Caribbean Development Bank; and
- World Bank.

These briefings and discussions were followed by several specific examples of regional climate-observation-related activities by the Caribbean Meteorological Organization (CMO), the Caribbean Institute for Meteorology and Hydrology (CIMH), the Water Center for the Humid Tropics of Latin America and the Caribbean (CATHALAC), and the CCCCC.

Finally, the meeting reviewed five updated project briefs, most of which were originally contained in the CAC RAP, that the region considered of especially high priority for implementation. These five project briefs were:

- The Provision of Additional and Better Upper Air Observations to Climatological Centers;
- Creating and Sustaining a Regional Technical Support Center;
- Improving Access to Climate Data in the Region;
- Adapting to Climate Change: Raising Awareness in Central America and the Caribbean; and
- An IOCARIBE-GOOS - GCOS Partnership to Support a Multi-Use Sea Level Observation Network for the Caribbean Region.

Several potential development partners indicated interest in one or more of the project briefs, although it was generally recognized that additional work would be needed to turn the project briefs into the more detailed proposals that would eventually be needed to be considered for funding. It was also recognized that one or more regional champions would be needed to advance the project proposals.

In order to facilitate the development of a road map for improved coordination and accelerated implementation of CAC-GCOS, the participants engaged in a wide-ranging panel discussion and considered a number of new and revised proposals for projects for inclusion in the updated CAC-GCOS Regional Action Plan. The sponsor, donor and partner organisation representatives, in particular, offered both advice and indications of support for proposals for improved observations from existing GCOS networks and a number of new observing initiatives which have assumed increased importance as a result of the requirements of the UNFCCC Nairobi Work Programme and the various climate modelling, impact assessment, and adaptation initiatives in the region.

The meeting agreed that, in order to provide stronger leadership, enhanced coordination, and increased momentum for GCOS implementation in the region:

- The Deputy Director of CCCCC, in his capacity as President of Regional Association IV of WMO, should take the lead in convening the regional representatives of the four sponsor organisations (WMO, IOC, UNEP, and ICSU) as a CAC-GCOS Regional Coordination Committee to guide the further development of GCOS in the region;

- The GCOS Regional Coordination Committee, in consultation with the various regional climate organisations and mechanisms, should finalise the role description for a GCOS Regional Coordinator based on the generic terms of reference presented to the meeting, and seek donor support for early appointment of the Regional Coordinator to be hosted by the WMO RA-IV Sub-Regional Office, the CCCCC or one of the other leading climate observation-related organisations in the region;
- The priority task of the CAC-GCOS Regional Coordinator, under the guidance of the CAC-GCOS Regional Coordination Committee should be the updating of the Regional Action Plan and liaison with potential donor and partner organisations on the funding and implementation of key projects within the overall framework of the global Implementation Plan for GCOS;
- In order to ensure effective coordinated implementation of GCOS in the region, in response to evolving user needs for climate data, the Coordination Committee should arrange for an (at least) annual GCOS Implementation Coordination meeting, involving all regional GCOS stakeholders, desirably in conjunction with one or more regular climate meetings in the region; and
- Effective, ongoing communication links should be established between the CAC-GCOS Regional Coordinator and the GCOS Secretariat in Geneva in respect, in particular, of the work of the GCOS Cooperation Mechanism for resourcing of GCOS implementation in developing countries;

The participants expressed their appreciation to the host and sponsors of the meeting and expressed the hope that the renewed focus and momentum which it had provided for GCOS implementation in the CAC region and Mexico would be maintained and strengthened through the agreed road map.

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## **INTRODUCTION**

This report records the outcome of a meeting held in Belize City, Belize on 28-30 January 2008, under the joint auspices of the Secretariat of the Global Climate Observing System (GCOS) and the Caribbean Community Climate Change Centre (CCCCC), to advance the implementation and further development of the GCOS Regional Action Plan for Central America and the Caribbean (CAC).

GCOS was established in 1992, under the joint sponsorship of the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the United Nations Environment Programme (UNEP) and the International Council for Science (ICSU), as an integrated global system of atmospheric, oceanic, and terrestrial observing systems. It is designed to meet the full range of needs for climate and climate-related observations in support of all components of the World Climate Programme (WCP),<sup>3</sup> the Intergovernmental Panel on Climate Change (IPCC), and the UN Framework Convention on Climate Change (UNFCCC). GCOS is built on the established global observing systems operated by the member countries of its sponsors, and its mission is to ensure the availability and quality of the atmospheric, oceanic and terrestrial data needed for climate system monitoring, research, prediction, impact assessment, and response actions at global, regional and national levels. The WMO-IOC-UNEP-ICSU GCOS Steering Committee and the GCOS Secretariat seek to advise and assist individual countries and regions in the coordinated implementation of GCOS within the overall framework of the global 'Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC' ('Implementation Plan') and more detailed Regional Action Plans for each of ten key regions of the world, including the CAC region.

The CCCCC was established in July 2002 by the Caribbean Community Heads of Government to coordinate the regional response to climate change and to serve as the key node for information on climate change issues and Caribbean efforts to manage and adapt to climate change. Its mission is to support the people of the Caribbean as they address the impact of climate variability and change on all aspects of economic development. It does this through the provision of timely forecast and analysis of potentially hazardous impacts of both natural and man-induced climate changes on the environment and the development of special programs that create opportunities for sustainable development. The Centre's activities include the provision of a clearing-house function, execution of donor projects, collaboration with other institutions, climate modeling, environmental scanning, training, and the provision of consultancy services.

Comprehensive, reliable climate observations are essential for support of all components of the CCCCC mission as well as those of the regional counterparts of the GCOS sponsors and the various other CAC regional organizations working on climate matters. For this reason, the GCOS Secretariat and the CCCCC agreed to co-sponsor the Belize meeting in order to involve all stake-holders, including particularly potential donor agencies, in the further planning and accelerated implementation of CAC-GCOS.

## **BACKGROUND TO THE MEETING**

At the invitation of the Conference of the Parties to the UN Framework Convention on Climate Change, the Secretariat of the Global Climate Observing System (GCOS) undertook a 5-year Regional Workshop Programme beginning in the latter half of 2000. The central goal of the GCOS Regional Workshop Programme was to initiate processes in developing regions that would lead to real, substantial, and lasting improvements in global climate

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<sup>3</sup> Following the reorganization of WMO, which went into effect in January 2008, the former WCP is now one of the components of the WMO Climate and Water Department.

observing systems. The rationale for seeking such improvements was (and is) the fact that climate observations in many parts of the developing world are inadequate--and in many places declining with time rather than improving--at a time when comprehensive reliable observations are assuming greatly increased importance for detecting and attributing climate change, monitoring the climate system, predicting future climate change and its impacts, and developing strategies for adapting to climate variability and change. Adequately functioning observing systems are an essential underlying need supporting sustainable development, including for use in agriculture, coastal zone management, disaster risk management, health care, water resources planning, and tourism.

The specific objectives for each of the GCOS regional workshops, which were supported by the United Nations Development Programme (UNDP) and the Global Environment Facility (GEF) were:

- to assess the contribution of each region to GCOS baseline networks;
- to help participants understand guidelines for reporting on systematic observations to the UNFCCC;
- to identify national and regional needs and deficiencies for climate data, including needs for assessing climate impacts, conducting vulnerability analyses, and undertaking adaptation studies; and
- to initiate the development of a Regional Action Plan for improving climate observing systems.

The third workshop in the 10-workshop programme was held for the 25 countries of Central America and the Caribbean (CAC) in Costa Rica in March 2002. As with other workshops in the Programme, the principal invitees to the workshop were the Directors of the National Meteorological and Hydrological Services (NMHSs) of the region, the designated national climate change coordinator of each CAC country, and a number of observing system experts. A follow-up meeting was held in Barbados in May 2002 at which a subset of those who attended the regional workshop convened to develop a Regional Action Plan based on the priority needs identified at the Costa Rica meeting. The resulting Plan contained thirteen project briefs addressing priority climate observing needs in atmospheric, oceanic, and terrestrial domains as well as related needs concerning access to data and metadata; regional coordination; and education, training, capacity building, and awareness building.

In the five years since the CAC Regional Action Plan was completed, the Plan has been available for use by the region as an aid in seeking funds to implement CAC regional priorities for climate observations. Some progress has been made in addressing the priority needs identified in the Plan's project briefs. However, many important elements of the Plan have not yet been implemented or have been implemented only in part. One important obstacle in the CAC region, as in other parts of the developing world, is the lack of available funds within individual countries or in the region as a whole for maintaining established observing systems and implementing improvement projects. Related obstacles are often a lack of knowledge of how to go about obtaining needed external funding and, for regional projects, a lack of the coordination required to develop successful regional-level project proposals. It is also the case that there are numerous activities related to climate and climate observing systems being undertaken and planned in the region, but that many of those with a central concern with climate issues are not fully aware of what others are doing. Greater coordination to both avoid overlapping efforts and to take advantage of potential synergies is critical, especially given the likelihood that funding for needed improvements will always be scarce.

The CAC Regional Action Plan has always been intended to be a "living document." The drafters of the Plan wished that it be used as a tool to spur action. And, as actions are completed and/or as conditions change, it is intended that the Plan be updated to reflect current needs. One, but by no means the only, emerging need is to ensure that the

observations necessary for developing effective strategies to adapt to climate change are available in the region. And climate observing requirements for adaptation, which will be addressed at the regional and local levels, are even greater than those required for global purposes. In proposing to organize an implementation strategy meeting, regional climate institutions, NMHSs, and GCOS recognized that the time had come to reexamine the status of the Regional Action Plan for Central America and the Caribbean, to make adjustments in that Plan as necessary, and to make a concerted effort to identify the resources necessary to address current priority needs for climate observations and related requirements, including those for adaptation.

## THE GOALS OF THE MEETING

In accord with the desire to enhance the coordination of climate observation initiatives in the region, to update the GCOS Regional Action Plan for Central America and the Caribbean and to identify the resources to fund priority projects, the Caribbean Community Climate Change Centre (CCCCC) and the GCOS Secretariat identified the specific goals of the meeting as:

- to reassess the needs for observing system improvements in the CAC region and Mexico;
- to discuss in greater detail several proposals to address the highest priority needs;
- to develop a regional strategy to implement these proposals, including a coordination strategy; and
- to exchange information with prospective donors on their interests in, and criteria for funding, projects.

The meeting organizers set out to materially advance the prospects for funding priority observing system needs in the CAC region and thus to ensure that the climate information needed by a variety of users is available. They recognized that addressing regional climate observing priorities also contributes significantly to the aims of the Group on Earth Observations, which is coordinating efforts to build a Global Earth Observation System of Systems, or GEOSS, serving a wide range of societal benefit areas, including climate.

## SESSION I: OPENING AND OVERVIEW

**Mr. Carlos Fuller**, the Deputy Director of the CCCCC and President of WMO RAIV, opened the meeting by greeting and welcoming all participants. He reviewed the purpose of the meeting and noted the importance of climate observations for a number of user sectors, including agriculture, health, shipping, tourism, etc (see Appendix 3). However, he pointed out that climate observing networks have been declining in the region, which was why the region welcomed the establishment of the GCOS Regional Action Plan (RAP) for Central America and the Caribbean (the Executive Summary of this Plan is given in Appendix 6). He further noted, however, that many of the project proposals in the RAP had not been implemented and, therefore, an important purpose of the meeting was to seek guidance from the meeting participants on how to move the process forward.

**Mr. Alan Usher, representing the Honorable Florencio Marin**, Belize Minister of Natural Resources and the Environment, stated that it was an honor for Belize to host this meeting. He indicated that Belize sees itself as a bridge between the Central American and Caribbean countries, with a foot in both subregions, and he noted the many cultural and political links it has with countries in the subregions that make it an ideal host for this regional meeting (see Appendix 4). Belize, he indicated, sees climate change as an extremely important issue for the CAC region and recognizes the importance of regional coordination. He pointed out that Belize coordinates the position of the G-77 and China on research and systematic observation in the UN Framework Convention on Climate Change and that it therefore welcomes this initiative to jumpstart the implementation of the CAC Regional Action Plan.

He concluded his remarks by challenging participants to undertake commitments to advance implementation of the CAC RAP.

The Chairman of the WMO-IOC-UNEP-ICSU Steering Committee for GCOS, **Dr. John Zillman**, expressed the warm appreciation of the GCOS sponsors, Steering Committee and Secretariat to the Government of Belize and to the CCCCC for hosting and co-sponsoring the meeting. By way of introduction, he provided an overview of the role of GCOS in supporting a wide range of user communities and programs at the global level (see Appendix 5). He explained how these programs are designed to assist individual countries to make optimum use of climate data for managing natural climate variability and for adapting to human-induced change at the national level. The challenge for those responsible for GCOS implementation at both the international and the national level is to ensure the comprehensiveness, continuity, and quality of the climate observing networks and systems required to meet the most important national needs. Dr. Zillman stressed the importance of ensuring that the national observing networks and systems conform to international standards and that they are fully coordinated with other national networks in the region. Good observational data will be critical to the development of national strategies for adaptation to climate change under the UNFCCC Nairobi Work Programme and through other regional and national programmes. The May 2003 GCOS Regional Action Plan for the region was designed to meet those needs. The challenge now for the region and those providing assistance with its implementation will be to refine and focus the Plan and develop a systematic strategy and resourcing arrangements for its implementation.

Dr. Zillman stressed that a properly integrated global climate observing system based on the Global Observing System of the World Weather Watch, the Global Ocean Observing System (GOOS), and the various other established observing systems, would achieve much more than the sum of its individual parts. He also stressed that it was very important to have coordinating mechanisms for GCOS issues at both the national and regional levels. He noted that ultimately observations are required to support user needs and thus that continuous liaison with users was extremely important. He urged participants to try to ensure that, within a 5- to 10-year time frame, national needs for climate observations are met and global needs are served. He urged the region to find a way to do this using existing mechanisms, building on the role of the region's National Meteorological and Hydrological Services (NMHSs) and their ocean and terrestrial observing counterparts, and through coordinated interaction with user communities.

He suggested that, in order to meet the Minister's challenge and to ensure the effective implementation and operation of GCOS in the region, it would be important for the meeting to agree on the establishment of a CAC-GCOS coordination mechanism under the broad auspices of the GCOS sponsors, to establish a process for regular assessment of progress and updating of the Regional Action Plan, to coordinate proposals with potential donors for funding support for priority projects, and to reach agreement amongst all stakeholders on implementation coordination arrangements for the region.

**Dr. Kenrick Leslie**, the Executive Director of the CCCCC introduced the activities of his organization through the presentation of a new video produced by the Centre entitled *Addressing Climate Change in the Caribbean*. CCCCC activities include: 1) a clearing house function to assist in accessing and sharing information, 2) execution of donor funded climate change projects, 3) collaboration with regional and international agencies on climate change issues, 4) climate modeling, 5) identification of climate-related threats, 6) training on climate change-related issues, 7) consultancy services, and 8) management of a trust fund to support research and other activities.

**Ms. Patricia Ramirez**, representing the Regional Committee for Hydraulic Resources/ Central America Integration System (CRRH/SICA) gave a presentation from the Central

America perspective on “Why Invest in the Global Climate Observing System?” She noted that climate change vulnerability assessments developed in Central America show the region’s high vulnerability to climate change. Because of the likely impact on water and coastal resources, among others, climate change is perceived as a threat to the region’s development efforts. She indicated that this concern, and the need to plan for adaptation, has reached high levels in the regional political agenda.

She noted the need for more reliable data for climate monitoring, scenario development, and assessment of climate change adaptation measures. Adequate data are recognized as fundamental to properly inform decisions related to important development projects that are planned or ongoing in the region. In the case of Central America, it is expected that the strengthening and sustainability of climate observation and monitoring systems could be included in the Strategic Lines for Climate Change, Environment, and Development that the XXXIst Summit of Region’s Presidents and Heads of States will be considering in May 2008.

**Mr. Dick Thigpen**, the GCOS Implementation Project Manager described the baseline networks, GSN and GUAN, illustrating the performance of the stations within the region. He described the technical support projects that GCOS has established around the globe, including the one that functioned for 2 years in this region. Mr. Thigpen further described the establishment of the CBS Lead Centers for GCOS, showed the GCOS station renovation projects, and described the GCOS Cooperation Mechanism. These activities were described in order to illustrate general classes of projects that the participants might wish to consider.

**Mr. Steve Pollonais** discussed the assessment he undertook for the GCOS Secretariat on the implementation status of the projects that were contained in the Regional Action Plan for Central America and the Caribbean (see Appendix 7). In this assessment directors of the National Meteorological and Hydrological Services of the CAC region were asked for their opinions on the highest priority needs for the region. Only a limited number of responses were received, but those who responded to the questionnaire identified three proposals that appeared in the RAP as of continuing importance. These included: 1) climate change awareness development workshops, 2) support for a regional technical support center (TSC), and 3) data rescue. Following additional discussion with key people in the region, Pollonais also identified the need to improve 1) the GCOS surface and upper air networks, 2) database management, and 3) the tide gauge network as also of high importance.

Pollonais noted that the greatest challenge, in his view, remains the harmonization of different data collections under one central entity for the efficient utilization and application of information in research and other investigative pursuits. To do this, data must be freely exchanged. However, he noted that, in some cases, the free exchange of data is difficult due to a desire to protect against commercial uses of what is considered a valuable national resource.

Pollonais noted several shortcomings that hinder the progress of the NMHSs to provide needed services. These include: 1) inadequate network density; 2) shortcomings in data quality, which might be improved, e.g., through maintenance and calibration of meteorological and hydrological instrumentation; 3) data collection shortcomings, 4) inadequate observation frequency; 4) the need for common software for the maintenance of climatological records; and 5) the need to rescue data from scattered archives for use in climate applications. He also noted needs to improve the rain gauge network and to share rainfall data, in particular, given the existence of multiple rainfall networks.

Pollonais noted a number of important training needs in the region, including for database management, hydrology, statistical analysis for climatologists and hydrologists, and in the maintenance and calibration of equipment. Finally, he stressed the need to make better use of existing climate models and/or to develop regional models, noting that the region must be

in a position to project changes in climate if meaningful decisions are to be made on future economic and security needs. The use of regional models also requires special training, for example in the use of the United Kingdom's PRECIS model.

At the end of the morning session, participants were invited to introduce themselves. Following these introductions, the High Commissioner for the United Kingdom, the Hon John Yapp, expressed his pleasure at the focus of the meeting and stressed the high priority that the UK Government gives to the climate issue. He noted the fundamental role of observations in providing the information base for all aspects of action on climate change and the excellent leadership provided by the CCCCC and its Director Dr Ken Leslie, who had recently been appointed Commander by the Queen. He looked forward to the road map for GCOS Implementation that would emerge from the meeting and undertook to forward this to London.

## **SESSION II: REGIONAL CLIMATE COORDINATION MECHANISMS**

Session two was devoted to a series of presentations by representatives of regional organizations that do work related to climate. These presentations served to introduce the organizations and their missions to meeting participants. The presentations also set the stage for a subsequent discussion on the need for a GCOS coordinating mechanism in the region. Presentations were made by Dr. Marco González of the Comisión Centroamericana de Ambiente y Desarrollo (CCAD), Mr. Garfield Barnwell of the Caribbean Community (CARICOM), Mr. Tyrone Sutherland of the Caribbean Meteorological Organization (CMO), Dr. David Farrell of the Caribbean Institute for Meteorology and Hydrology (CIMH), Dr. Emil Cherrington of the Water Center for the Humid Tropics of Latin America and the Caribbean (CATHALAC), Dr. Cesar Toro of the Regional Subcommittee of UNESCO's International Oceanographic Commission (IOCARIBE), and Dr. Kenrick Leslie of the Caribbean Community Climate Change Center (CCCCC).

CCAD Executive Secretary, **Dr. Marco González**, gave a brief overview of the 1993 Regional Treaty on Climate Change, which has been signed by seven of the eight members of the Central America Integration System (SICA). Among other things, the Treaty creates a Regional Council for Climate Change. This is composed of national agencies in charge of meteorology and hydrology and of those dealing with environmental issues. These agencies have their own regional entities, the Central American Commission on the Environment and Development (CCAD) and the Regional Center for Hydraulic Resources (CRRH). The CCAD is currently preparing for a Presidential Summit on climate change and the environment, which will take place on 28 May 2008 in San Pedro Sula, Honduras. Among other things a "Stern Study" on the cost of climate change in Central America will be part of the documentation for the Summit. It is also developing a regional strategy on climate change for approval at the Summit. Gonzalez noted that a regional approach will be very important to move countries in the right direction on climate change.

**Mr. Garfield Barnwell**, representing the Caribbean Community (CARICOM), discussed the mission and structure of this organization. He indicated that the three pillars of CARICOM were to promote economic integration, functional and social cooperation, and foreign policy coordination. One of the important challenges of CARICOM was the need to improve the management of the regional environment. The CCCCC, he noted, was a specialized institution of CARICOM.

**Mr. Tyrone Sutherland**, representing the Caribbean Meteorological Organization (CMO), the Specialized Agency of the Caribbean Community (CARICOM), gave a brief description of the Organization's history, structure and mandate. The CMO, established in 1973, provides support and advice to governments of its 16 English-speaking Member States in the development of their NMHSs and in dealing with issues of an international nature

affecting weather, water, and climate. Through its headquarters in Trinidad & Tobago, the CMO undertakes the coordination of joint scientific activities of the respective NMHSs, including project formulation and implementation, the establishment of joint technical facilities and systems, and the promotion of a reliable severe weather warning system to safeguard the region.

The Caribbean Institute for Meteorology and Hydrology (CIMH) was represented by **Dr. David Farrell**. CIMH is an organ of the CMO located in Barbados. It provides training for the region's professional and technical staff in meteorology, hydrology, agrometeorology and other related disciplines. The CIMH serves as the CMO's research and climate centre, as well as the regional instrument calibration and maintenance centre. It has a long-established teaching and research relationship with the University of the West Indies. Dr. Farrell gave brief examples of climate and climate-change research activities being undertaken by CIMH.

**Mr. Emil Cherrington** of the Water Center for the Humid Tropics of Latin America and the Caribbean (CATHALAC) presented an overview of the role of this organization in support of climate observation in Mesoamerica and the Caribbean. CATHALAC is a UNESCO regional center of excellence dedicated to the promotion of sustainable human development through integrated management of water & environmental resources. He discussed several projects of relevance to GCOS, including the projects known as Mainstreaming Climate Indices and Weather Derivatives into Decision-Making for Adaptation to Climate Change in Central America, Mexico, and the Dominican Republic, and Capacity Building for Stage II Adaptation to Climate Change in Central America Mexico and Cuba. He noted that the Regional Visualization & Monitoring System (SERVIR) project, on which he would be speaking in more detail later in the meeting, is an important joint effort with NASA, CCAD, USAID, and the World Bank that is of great utility to the climate and other communities.

**Dr. Cesar Toro** of the Intergovernmental Oceanographic Commission's Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE) described the operational ocean observing mission of his organization. Toro noted that the wider Caribbean region is geographically and politically complex, comprised of some 33 state entities. These entities vary by ethnicity, language, size, wealth, level of development, and capacity for implementing activities. The Caribbean Sea is almost completely taken up by the Exclusive Economic Zones of these entities. As the scientific and technical capacity of the state entities is generally small, capacity building is important. The vision of IOC capacity building is to establish networks of scientists, managers and other practitioners working within regional and other cooperative mechanisms to create demand-driven science, enhance protection of the marine environment, and provide operational oceanographic services for the benefit of all humanity. Toro noted that improved marine observations will lead to better air quality forecasting and management, climate prediction, ocean condition forecasting, and weather prediction and management. In turn, this would have a positive impact on tourism, transportation, coastal construction, fishing, finance, and the health sectors.

Following the regional presentations, **Dr. Michel Rosengaus** chaired a general discussion on establishing a coordinating mechanism for GCOS issues within the region. He challenged participants to explore the feasibility and desirability of establishing an institution or institutions to be responsible for taking GCOS issues forward. However, he noted that establishing such an institution(s) may be more difficult than it seems, as the region is divided into several distinct subregions, e.g., the Central American countries and the Caribbean Countries; is divided by language, i.e., English, Spanish, and French; encompasses atmospheric, oceanic, and terrestrial observing domains; and has within it various regional institutions that have mandates within only a subset of the region or that encompass only one of the observing domains. Thus, he wondered what the ideal coordination mechanism would be, given such diversity.

In the discussion that followed, all agreed that a coordinating mechanism for GCOS was important to have. However, a variety of views were expressed, and a number of problems were raised. Some argued that ultimate coordinating responsibility should be vested in one organization. Those who took this view noted that there needed to be a regional leader with ultimate responsibility for ensuring that coordination takes place and that dividing responsibility may lead to problems. Others advocated the notion of dividing coordinating responsibility between several regional organizations, in effect recognizing the existing mandates of those organizations. A hybrid possibility mentioned was to have the coordinating function centered in one regional organization but to have a joint coordinating or steering committee composed of the representatives of the regional organizations represented at the meeting. Finally, the idea of creating a virtual coordinating function, as opposed to one located at a physical location, was introduced.

A second major issue raised was the need for one or more staff who could do the day-to-day coordinating job. It was pointed out that the coordinating need was not a trivial one but in fact would require a large effort and that the job was easily substantial enough to require the full time effort of at least one senior person. Thus, for any organization to undertake the coordinating function, new resources would be required. No organization should be expected to do the job without additional resources. Some ventured that establishing a coordinator could be a new regional project that would be added to the list of existing projects for which external funding will be sought.

Several other issues were raised related to coordination. First, it was pointed out that there are several “trouble spots” in the region, for example, states that don’t easily fall within one of the regional groupings like Haiti and Cuba. These would need to be included in any coordinating mechanism. Second, the role of the WMO Office in Costa Rica was discussed. Although this office wishes to have an active role, its preliminary view was that it would not be desirable for it to undertake the regional coordinating responsibility for GCOS issues. Third, the need to involve the National Meteorological and Hydrological Services (NMHSs) in any coordinating activity and not just focus on regional organizations was noted.

In the course of the discussion several representatives of the regional organizations present expressed interest in undertaking or being involved in the coordinating function. The CCCCC itself was deemed to be an especially appropriate institution within which to house a coordinator. However, all expressed the opinion that before any decision could be taken more needed to be known about the actual functions of the coordinator. That is, before a decision could be made, Terms of Reference (TORs) for a regional coordinator should be developed. Dr. John Zillman, Chairman of the GCOS Steering Committee, offered to prepare draft TORs for further discussion at the meeting. It was noted that some, but not all, of the functions of a regional coordinator are undertaken by the GCOS implementation manager, so that one may wish to review those functions in developing TORs, and also that the Pacific Islands GCOS has employed a coordinator that, although limited in its functions, might serve as a model.

### **SESSION III: REVIEW OF DONOR ORGANIZATION ACTIVITIES AND PRIORITIES**

**Dr. Francisco Villalpando** of the WMO Resource Mobilization Office began Session III with a presentation titled ‘Resource Mobilization for the Development of National Meteorological and Hydrological Services’. The presentation first covered the responsibilities of the new WMO Resource Mobilization Office. The objective of the office is to enhance the level of externally funded programmes, especially those funding least developed countries (LDCs) and Small Island Developing States (SIDS). Dr. Villalpando noted that the means for doing this includes: developing a funding agency information system, providing guidance to WMO field offices in resource development issues, developing expertise for estimating the socioeconomic benefits of NHMSs, administering the Technical Cooperation and Voluntary

Cooperation Programmes, developing strategic partnerships with international funding agencies, liaising with other United Nations organizations on resource mobilization, developing a training programme in resource mobilization for WMO staff, and coordination of applications for funding among WMO programmes.

Dr. Villalpando noted that better results are achieved when funding opportunities are identified prior to the preparation of a proposal. In that case a proposal can be adapted to the specific opportunity rather than sending it to a prospective funder without any knowledge of the funder's likely interest in it. Likewise, it is important to understand the donor's procedures for submission of project proposals before preparing one. It is especially important to develop partnerships with funding agencies and, in this regard, to identify and work with focal points within funding agencies. Villalpando gave several examples of successful projects in which WMO has been involved and noted that when WMO has shown that it is capable, it is the first step towards developing long-term trust, thus enhancing the probability of successful funding for future projects. When developing a proposal, among the things to consider are: the donor's priority areas of support, its funding mechanism, project cycle considerations, procedures for submission, the need to use key words and simple language, and the need to emphasize the impacts the proposal will have rather than the activities undertaken.

Finally, Dr. Villalpando noted that the Resource Mobilization Office could help the GCOS Secretariat in several specific ways, first, in helping to identify resource mobilization opportunities for specific projects, second, in facilitating linkages with international and donor organizations, third, in helping to assess the socioeconomic benefits of projects, thus enhancing their appeal, and finally, in helping to coordinate ongoing and planned projects with other WMO offices.

**Mr. Patrick Quealey** of Canada's Department of Foreign Affairs and International Trade spoke next about Canada's commitment to address needs related to climate change. He noted an increased sense of urgency to take action on the issue and cited the Americas region, in particular, as a priority area for Canada. He noted that addressing gaps in scientific knowledge through improving observing networks was of special interest and identified a need for greater commitment on the part of potential donors to assist in the implementation of the GCOS Regional Action Plan for Central America and the Caribbean. Thus, on behalf of Canada, Quealey announced that it would provide \$50,000 to help fund a Technical Support Programme for the Americas region. He noted that although it is a modest amount it is a first step to help address needs, and he expressed the wish that it would help motivate other contributions. It is intended also that GCOS's work in the CAC region should serve as a contribution to the Global Earth Observation System of Systems (GEOSS) and be linked to the GEOSS in the Americas initiative.

Mr. Quealey's presentation was followed by a presentation by **Ms. Cheryl Dixon** of the Caribbean Development Bank. Ms. Dixon provided an overview of the Bank's activities in the Caribbean region, noting that its overall goal was to help to reduce poverty in the region. Cross-cutting themes the Bank is supporting that are likely to be of special interest to the meeting participants were environmental sustainability and disaster risk reduction. Environmental issues are treated in the Projects Department, where the goal is to integrate environmental concerns into routine operations. The Bank's environmental policy is being revised, and the new policy should be in place by May 2008. Themes should include disaster risk reduction, climate change, and adaptation.

Ms. Dixon noted that the Bank is familiar with the inadequacies of data in the region and that it is working with other development partners to help to improve the quality and quantity of the data needed to address environmental concerns. She noted the willingness of the Bank to assist organizations at the regional and sub-regional level, such as CCCCC, CIMH, and

CARICOM, and noted as an example work to establish a Trust Fund with the CCCCC. Of particular interest is the Bank's assistance in establishing an Information Clearinghouse for the region that would function to disseminate climate change information to member states. It was noted that this project appeared as a proposal in the original GCOS RAP for Central America and the Caribbean. The Clearinghouse would also provide outputs from regional downscaling. The director of the CCCCC noted that it will enable the center to house all information relevant to climate change so that all institutions in the region will have this information available.

**Dr. Laura Canuto**, representing the Government of Italy, provided an overview of Italy's work to address climate change in a presentation titled 'The Strategy and International Commitments of Italy for Mitigation of and Adaptation to Climate Change'. She noted that Italy provides support for 47 developing countries, with a focus on countries in the Mediterranean Basin. However, she mentioned that Italy supports SIDS countries worldwide, some of them in the Caribbean, and that it is been a strong supporter of the CCCCC from its inception. It has provided the CCCCC some \$800,000 in the last three years for climate risk management activities and wishes to collaborate further.

Next, **Mr. Cletus Springer** of the Organization of American States (OAS) provided an overview of GCOS-related activities of the OAS. He observed that the aim of his department, the Department of Sustainable Development, is to integrate environmental protection and poverty reduction and that it supports the execution of multi-country projects in integrated water resources management (IWRM) and mitigation and adaptation to climate change, among others.

Springer noted that the Organization of American States has been actively involved in various GCOS-related activities in the Western hemisphere since the 1950s. Acting through its Department of Sustainable Development, the OAS has been assisting its member states in building their capacity to pursue sustainable development through targeted interventions in environmental protection and natural resources management.

The OAS is the repository of a significant amount of data, maps and lessons and experience from its activities in: Integrated Water Resources Management (IWRM); climate variability and climate change; natural hazards risk management; energy efficiency and renewable energy; biodiversity; and sustainable land management. Among the products that are of specific relevance to the GCOS mandate are:

- The availability of 1600+ maps dating back to the early 1950s that provide critical baseline data and indicators of trends in land use and land conversion;
- The availability of hemispheric networks in areas such as the Inter-American Biodiversity Information Network (IABIN); the Inter American Water Resources Network (IWRN); and the Inter-American Natural Disaster Management Network (INDM);
- The ongoing implementation of a diverse (thematic and geographic) suite of projects that will contribute valuable lessons and products in water resources management, climate change, biodiversity, and natural hazard risk management; and
- Well-established institutional linkages with key regional and international organizations including with the Caribbean Community Climate Change Centre (CCCCC) the Caribbean Community Secretariat (CARICOMSEC); and UN system agencies involved in sustainable development activities.

The OAS reaffirmed its willingness to participate actively in promoting the attainment of the objectives of GCOS in the Hemisphere.

The OAS is developing a natural hazard risk reduction programme in which climate change will be one element. It expects to have a long-term agreement with CCCCC related to this programme. Sustainable land management was cited as one of the most pressing environmental concerns at this time, and the OAS is working to develop an early warning system for drought, floods, landslides, fires, etc. It is now looking for co-financing for the \$12 million project to complement \$6 million being provided by the Global Environment Facility (GEF), and it is seeking other organizations to adopt components of the project. Dr. Villalpando of the WMO noted that there could be an important role for the NMHSs of the region and offered WMO support to the programme.

**Dr. Doug Wilson** of the U.S. National Oceanic and Atmospheric Administration (NOAA) and the IOCARIBE-GOOS Co-Chair spoke next on the role of NOAA in the region. He noted that he was at the GCOS meeting primarily supporting the IOCARIBE-GOOS proposal. He was not representing NOAA policy but would report comments to appropriate NOAA programs. He stated that from an Observing System Standpoint:

- NOAA is very active on Global Climate Observing System activities and bilateral agreements but less so on regional activities;
- To be more successful in requesting NOAA support, NOAA needs specific requests from programs and organizations that can be easily connected to existing NOAA programs; For example, NOAA provides good support to Caribbean region meteorological services and WMO activities because of the clear impact of those observations on US weather;
- Similarly, requests through State Dept channels (USAID, CARICOM, etc.) should call out specific requests for NOAA capabilities, for example, the CREWS station provided by NOAA with World Bank funding).

A present NOAA activity of interest is ongoing cooperation with the US State Department in discussions on a Science and Technology agreement with CARICOM. Here, we need to make sure environmental and climate issues are referenced. NOAA is also active in GEO and GEOSS – GCOS, GOOS, etc. need to work with GEO to see how they coordinate common efforts. This is important since we cannot separate the observations necessary for understanding climate change in the region.

Dr. Wilson also highlighted the need for a multi-purpose sea level monitoring system in the region, noting that Cesar Toro would be presenting details of a proposal in Session V. In discussion following the presentation, it was noted that the region has always had good collaboration with NOAA's National Weather Service (NWS) but that to date collaboration has worked less well on the oceans side of NOAA. It was also noted that one weakness in the Caribbean is a lack of sea surface data and that it would be especially useful for NOAA to jumpstart sea surface observations. Wilson agreed that more multi-purpose buoys were needed for this and other purposes. Finally, NOAA's support for the Technical Support Project was noted.

**Mr. Walter Vergara** of the World Bank's Environmentally and Socially Sustainable Development unit for Latin America and the Caribbean Region spoke on 'Information for Decision making on Climate Change.' He began by noting that a substantial amount of cooperation exists between the World Bank and the CCCCC. He remarked that part of the World Bank strategy in the region is to support adaptation to climate change, including the links between knowledge, capacity building, and decisionmaking. He noted the strong commitment of the Bank to the Kyoto Protocol to the UN Framework Convention on Climate Change and cited the launch of a \$2 billion Climate Investment Fund devoted to low carbon projects. He also noted that the first steps have been taken to launch an adaptation fund.

Mr. Vergara described in some detail the Bank's CPACC and follow-up MACC (Mainstreaming Adaptation to Climate Change) projects, and, in particular, its collaboration with the CCCCC on the MACC project. The MACC project, which focuses on sea surface temperature and sea level measurements in the Caribbean Sea, gives a second chance to address issues that hampered the success of the original CPACC project. It also has potential for becoming a key GCOS element. Vergara described what the ideal network for the Caribbean Sea would look like. It would: be reliable, be multi-purpose, be able to store and provide information on request, have participating countries committed to long-term operation and maintenance, be flexible enough to expand and provide additional services as required, be serviced and maintained by a dedicated unit, and be complemented by remote sensing and monitoring.

Other activities in which the Bank is engaged in the Caribbean are monitoring of coral reefs, monitoring of seagrass beds, and monitoring of vulnerable coastal systems. The Bank is also working with CCCCC on these projects. The Bank also supports remote sensing, and Vergara introduced the Advanced Land Observation Satellite (ALOS), which he noted has especially good monitoring potential for the region. He also noted the Bank's interest in modeling and cited the example of the use of the Japanese "earth simulator," one of the largest computers available for civilian purposes, to model climate change.

In concluding, Vergara noted the unique position of the CCCCC and advocated that the CAC region use this important resource. He noted that the observing systems in the Caribbean are key to policymaking and design of effective adaptation measures. And he noted that the World Bank is committed to regional approaches on climate issues, especially in this region of small island countries.

#### **SESSION IV: EXAMPLES OF REGIONAL CLIMATE ACTIVITIES**

Dr. John Zillman, the chair for this session, opened by pointing out the necessity of filling gaps and deficiencies in *existing* observing systems rather than proliferating new networks. He noted that the meteorological observing world is littered with the wreckage of projects that were implemented outside the established structures and came to an end when the key person moved on. Thus, it is important that existing and long-lasting institutions, such as the NMHSs be employed. Dr. Zillman also pointed out the importance of regional coordination, noting that Terms of Reference for a coordinating function would be discussed.

**Mr. Tyrone Sutherland** of the Caribbean Meteorological Organization gave an overview of current and planned projects relating to weather and climate data and observations that contribute or can contribute to the GCOS Action Plan in the region. Current projects include a 13.2 million Euro Caribbean Weather Radar Network, funded by the European Union, a Cayman Islands Radar Project and collaboration in the implementation of WMO hydrological projects for the Caribbean Islands. Pipeline projects include a regional lightning detection system, establishment or strengthening of runoff data collection from the large rivers in CMO States, development of a new network of observations and facilities in the Turks and Caicos Islands, meteorological data rescue of old data from non-traditional sources, such as from the old US military bases and US Weather Bureau stations in the Caribbean, and a metadata collection project.

**Dr. David Farrell** followed with a presentation of the work of the climate activities of the CIMH. He noted work on improving 3-month precipitation forecasts, on planning a Caribbean drought and precipitation-monitoring network, on a Caribbean Agrometeorology Network, on forecasting and numerical studies, and on various studies related to water resources management. He stressed that there is a great need to teach people in the region how to use climate information.

**Mr. Emil Cherrington** provided an overview of the SERVIR project, which he showed should be of particular interest to GCOS. SERVIR is a satellite visualization system that monitors the environment of Central America. It helps track and combat wildfire, improves land use and agricultural practices, and helps local officials respond faster to natural disasters. SERVIR's computer at CATHALAC in Panama City integrates data from a variety of sources and displays a real-time map of crisis points. At a glance, decision-makers can see where rain will fall, where flooding will occur, the location of forest fires, hurricanes, tornadoes, etc. CATHALAC then warns residents. SERVIR also supports the ten-year plan for implementation of the Global Earth Observation System of Systems (GEOSS). Cherrington showed a video on SERVIR, which illustrated, among other things, the differences that varying the resolution of satellite imagery can make in detecting phenomena. While SERVIR has been introduced first in Central America, it has obvious uses in other regions as well.

**Mr. Joseph McGann** of the CCCCC gave a summary of the MACC project. MACC, which stands for Mainstreaming Adaptation to Climate Change, has four components:

- Building capacity to assess vulnerability and risks associated with climate change and climate variability, which seeks to build capacity to collect and analyze data and expand the overall knowledge base on climate change impacts and associated physical, social and economic vulnerabilities;
- Building capacity to reduce vulnerability to climate change, e.g., by building in-country capacity to formulate and analyze adaptation policy options and to finalize sectoral adaptation strategies for all countries;
- Building capacity to effectively access and utilize resources to reduce vulnerability to climate change, e.g., by helping to guide the development and implementation of climate change strategies for all countries in the region; and
- Public education and outreach. The objective of this component is to facilitate a participatory process in the development and dissemination of the outputs of technical project components and to serve as a clearinghouse for climate change information.

He noted that the executing agency function for the programme was transferred from the CARICOM Secretariat to the CCCCC in January 2007. Sea level and coral reef monitoring are important observation elements of the programme.

To conclude the session and the day, **Dr. Zillman** and **Mr. Fuller** summarized the discussion to this point and gave a preview of what they would like to achieve on the final day of the meeting. In particular, Dr. Zillman called attention to the important need for regional coordination on GCOS issues. He stressed that a mechanism needs to be put in place to ensure that the momentum being generated at the meeting can be maintained. He noted that a shortcoming to date in implementing the Regional Action Plan is that no one knows who is responsible for driving the process forward. Mr. Fuller called attention to the project proposals that have been prepared for the meeting and that will be discussed on the final day. He hoped that various regional bodies would champion one or more of the projects and that the donor organizations represented at the meeting would provide advice and comments on the proposals. In agreement with Dr. Zillman, he hoped that the participants would seriously consider establishing a coordinating mechanism. He also noted that the RAP needs to be updated on a continuing basis.

## **SESSION V: CAC PROJECT PROPOSALS FOR CLIMATE OBSERVATIONS**

This session focused on one of the most important objectives of the meeting, the introduction and discussion of several project proposals considered to be of high priority by the atmospheric and oceanic communities. These proposals were selected for discussion

after reviewing the original CAC Regional Action Plan and consulting directors of NMHSs in the region. **Mr. Danny Foster**, the consultant to GCOS who had prepared the four atmospheric domain proposals, presented each in turn. **Dr. Cesar Toro** of the IOC (UNESCO) Regional Subcommittee for the Caribbean and Adjacent Regions – IOCARIBE - then discussed the one oceanic domain presentation. These five proposals include the following:

1. The Provision of Additional and Better Upper Air Observations to Climatological Centers;
2. Creating and Sustaining a Regional Technical Support Center;
3. Improving Access to Climate Data in the Region;
4. Adapting to Climate Change: Raising Awareness in Central America and the Caribbean; and
5. An IOCARIBE-GOOS-GCOS Partnership to Support a Multi-Use Sea Level Observation Network for the Caribbean Region.

Mr. Foster began his presentation of the four atmospheric domain proposals by noting that none are finished products that could be submitted immediately to prospective donors. They are rather “project briefs” that have been designed to raise the interest of donors and to launch discussion at the meeting. All would not only need substantially more work, including refinement of budgets, before they could be submitted, but would need to be written using the required format of the interested donor or donors to which they would be submitted.

A review of the substance of the proposals is not included here, as they are included in their entirety in appendices 6 through 10 of this report. However, in discussion following each presentation some important issues were raised, so some highlights are provided here. Regarding Proposal 1 on improving the GCOS Upper Air Network (GUAN) and the Regional Basic Climatological Network (RBCN), a participant wondered whether the RBCN was part of GCOS. The answer is that GCOS is concerned with all networks that deal with climate, not just global-scale ones. Broader regional-scale networks, such as the RBCN, are of particular relevance for designing effective policies for adapting to climate change. Another participant noted that the funding by donor organizations of consumables, such as the radiosondes used at GUAN stations, has always been difficult. Consumables, he noted, were considered to be a national responsibility, which would imply that national agencies should also be involved in funding the project. The Caribbean Development Bank concurred by noting that donors could support capital improvements but probably not consumables. Thus, Mr. Foster noted that Proposal 1, as well as the others, should be thought of as joint efforts. The NMHSs would have to increase their inputs too.

Proposal 2, on creating a Regional Technical Support Center (TSC), has been proposed to help maintain the integrity of the observing systems in the region, in particular GSN and GUAN stations. Mr. Dick Thigpen emphasized that the region needs to find a way to make the proposed Center into an operation that would continue beyond the four years envisioned in the proposal. Dr. Rosengaus, echoing this thought, wondered what would happen when the support ends. Dr. Canuto pointed out that the TSC could become part of the coordinating mechanism for the region. Dr. Zillman stressed that the message must be gotten through to governments that it is overwhelmingly in their own long-term interests to properly fund their observing systems. And Mr. Fuller noted that a regional organization would be needed as a home for the TSP.

Comments on Proposal 3, on improving access to climate data in the region, included the observation that data in the region are compartmentalized, but that there is an obligation to pull it all together. Dr. Farrell of CIMH noted that they have a proposal to do so, but that it is limited to the subset of countries in the region for which it is responsible. Dr. Canuto noted that before rescuing data, it is necessary to do an assessment to determine exactly what

needs to be done. Ms. Ramirez of CRRH responded that just such an assessment will be done for Central American countries and will encompass data held by both the meteorological services and the private sector. Dr. Toro emphasized that, in addition to rescuing data, people in the region must be able to access it. One element of concern is that national governments haven't supported data rescue partly because it is so tedious. Nevertheless, Dr. Cherrington of CATHALAC saw the project as extremely important for the region. He noted also that it is the sort of one-off effort that need be done only once, and that once done, the information could be available for all. Significantly, the Caribbean Development Bank noted that this is the type of project for which it could consider providing support.

Raising awareness concerning adaptation to climate change, Project 4, was considered by some to be one of the most important. Dr. Canuto saw the project as a multi-donor, multi-country effort and suggested that the United Nations Development Programme be involved in its implementation. The UNDP representative at the meeting suggested that the workshops described in the proposal may be especially effective if focused on raising awareness at the community level. Ms. Ramirez stated that her organization, CRRH, would be pleased to become involved in the project. Importantly, Mr. Quealey of Canada's Department of Foreign Affairs and International Trade said that he believed that Canada would be interested in helping to fund this proposal.

The last proposal discussed addressed the development of a multi-use sea level observing network for the Caribbean. Dr. Toro of IOCARIBE proposed development of a partnership that would use what already exists to enhance sustainability; encourage multi-purpose installations; support common standards, information exchange, and applications; and work to strengthen existing programmes. One issue raised concerned the need to identify users who care about the continued operation of the stations. Dr. Toro noted that the project does indeed consider and address user needs and that he will make this more obvious when refining the proposal.

## **SESSION VI: NEXT STEPS FOR ALL PARTICIPANTS**

After a number of presentations and considerable discussion during the course of the meeting, Session VI provided an opportunity to sum up and to highlight the key points of agreement among participants and next steps for the region. The meeting participants agreed that good quality, reliable, long-term climate data are fundamental to all aspects of the regional strategy for addressing the climate issue. Hence, it is now time to focus on meeting the climate observing needs of the region. The participants noted that the 2003 GCOS Regional Action Plan for Central America and the Caribbean identified a number of projects that were considered to be high priorities but that much remains to be done to implement the projects contained in this plan and to update it to address new and emerging needs. It is important to build and maintain momentum toward implementation. To this end, the meeting participants agreed on the following four essential steps as a roadmap for GCOS implementation in the region. These included:

- Establishment of regional coordination mechanisms, including the following three essential elements:
  - Formation of a Regional Coordination Committee, which would be comprised of the regional representatives of the four international sponsors of GCOS (WMO, IOC, UNEP, and ICSU). Mr. Carlos Fuller in his role as the President of WMO RA IV could take the lead in convening his regional counterparts to form the committee.
  - Creation of a position for an externally funded regional coordinator for GCOS activities, such as already exists for the Pacific Islands. Meeting participants recognized that the regional coordinator would have substantial responsibilities.

Some draft Terms of Reference were proposed for the coordinator and are included in this report as Appendix 13.

- An annual meeting that brings together the key regional players to consider GCOS issues.
- Updating the GCOS Regional Action Plan for Central America and the Caribbean. This should include consideration of:
  - What can be achieved now by way of action on the proposals introduced in the meeting, and
  - Establishing an ongoing mechanism to keep the CAC RAP up to date and widely accepted as the authoritative strategy for climate observation in the region.
- Consideration of how to progress the resourcing of GCOS implementation. This would encompass:
  - Support for the established component systems of GCOS, and
  - Support for the specific projects introduced at this meeting.
- Establishment of a mechanism for implementation coordination, such as an annual meeting. The purpose of this would be to avoid duplication of effort. Such mechanism would allow stock taking on how the region is progressing, would involve regional partners and GCOS sponsors, and would reflect the needs of the user community. The meeting could be arranged by the Coordination Committee.

In order to focus the needed follow-up action and provide stronger leadership, enhanced coordination, and increased momentum for GCOS implementation in the region, the meeting agreed, therefore, that:

- The Deputy Director of CCCCC, in his capacity as President of Regional Association IV of WMO, should take the lead in convening the regional representatives of the four sponsor organisations (WMO, IOC, UNEP, and ICSU) as a CAC-GCOS Regional Coordination Committee to guide the further development of GCOS in the region;
- The GCOS Regional Coordination Committee, in consultation with the various regional climate organisations and mechanisms, should finalise the role description for a GCOS Regional Coordinator based on the generic terms of reference presented to the meeting, and seek donor support for early appointment of the Regional Coordinator to be hosted by the WMO RA-IV Sub-Regional Office, the CCCCC or one of the other leading climate observation-related organisations in the region;
- The priority task of the CAC-GCOS Regional Coordinator, under the guidance of the CAC-GCOS Regional Coordination Committee should be the updating of the Regional Action Plan and liaison with potential donor and partner organisations on the funding and implementation of key projects within the overall framework of the global Implementation Plan for GCOS;
- In order to ensure effective coordinated implementation of GCOS in the region, in response to evolving user needs for climate data, the Coordination Committee should arrange for an (at least) annual GCOS Implementation Coordination meeting, involving all regional GCOS stakeholders, desirably in conjunction with one or more regular climate meetings in the region; and
- Effective, ongoing communication links should be established between the CAC-GCOS Regional Coordinator and the GCOS Secretariat in Geneva in respect, in

particular, of the work of the GCOS Cooperation Mechanism for resourcing of GCOS implementation in developing countries;

### **Conclusion of the Meeting**

Dr. Zillman, as Chairman of the GCOS Steering Committee, and Mr. Fuller, as Deputy Director of CCCCC and President of RA IV, expressed their thanks to all participants for a stimulating and useful meeting. Dr. Zillman thanked the CCCCC and the Government of Belize for co-sponsoring and hosting the meeting and emphasized the need to maintain the momentum generated by the meeting. Mr. Fuller looked forward to working within the GCOS framework to address the CAC region's observing system needs for climate.

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**GCOS IMPLEMENTATION IN  
CENTRAL AMERICA, MEXICO, AND THE CARIBBEAN**

**AGENDA**

**Monday, 28 January**

- |                   |  |
|-------------------|--|
| 8:30-9:00         | Registration   |
| <b>Session I:</b> | <b>Overview</b>  |
| 9:00-9:30         | Welcome by the host<br><br>Carlos Fuller, President WMO RA IV<br><br>Hon. Florencio Marin<br>Belize Minister of Natural Resources and the Environment  |
| 9:30-9:55         | Dr John W. Zillman, Chairman GCOS Steering Committee<br><br><i>Role of GCOS in Support of Climate Services and Climate Change</i>  |
| 9:55-10:20        | Dr. Kenrick Leslie, Executive Director<br>CARICOM CLIMATE CHANGE CENTER (CCCCC)  |
| 10:20-10:30       | Participant Introductions  |
| 10:30-11:00       | Coffee Break<br><br>Press Conferences  |
| 11:00-11:10       | Dr. William Westermeyer, GCOS Secretariat,<br><br><i>Background: The Regional Workshop Programme</i>   |
| 11:10-11:35       | Ms. Patricia Ramirez, Central America Integration System, for<br>Executive Secretary Regional Committee on Hydraulic Resources<br>(CRRH-SICA)<br><br><i>Why Invest in the Global Climate Observing System?</i> |
| 11:35-12:00       | Mr. Steve Pollonais, Consultant to GCOS and CCCCC<br><br><i>Review of Progress in Implementing the Regional Action Plan for<br/>Central America and the Caribbean and Revised Priorities</i>                   |
| 12:00-12:25       | Dr. Dick Thigpen, GCOS Secretariat<br><br><i>Status of GCOS in Mexico and the CAC Region</i>   |
| 12:25-14:00       | Lunch  |

**Session II: Regional Climate Coordination Mechanisms**

14:00-15:45 Regional Presentations

- Session Chairman Mr. Carlos Fuller Rapporteur Mr. Oscar Arango
- Sistema de la Integración Centroamericana (SICA), Dr. Marco Gonzalez, Director CCAD
- CARICOM Secretariat, Garfield Barnwell
- Caribbean Meteorological Organization (CMO), Mr. Tyrone Sutherland
- Caribbean Institute for Meteorology and Hydrology (CIMH), Dr. David Farrell
- Water Center for Humid Tropics of Latin America and Caribbean, Mr. Emil Cherrington
- IOC (UNESCO) Subcommission for the Caribbean and Adjacent Regions, Dr. Cesar Toro
- Caribbean Community Climate Change Centre, Dr. Kenrick Leslie

15:45-16:15 Coffee Break

16:15-17:45 **PANEL DISCUSSION: Next Steps for GCOS Implementation in the Region**

Chairman: Dr Moisés Michel Rosengaus Moshinsky  
Rapporteur: Mr. Oscar Arango

**Panel Members:**

Dr. Marco Gonzales  
Dr. David Farrell  
Mr. Emil Cherrington  
Dr. Cesar Toro  
Ms. Patricia Ramirez  
Dr. Kenrick Leslie

- Begin with overview and comment on presentations by chairman
- Exchange among Panel Members
- Open discussion for all participants

Closure: Remarks by Dr Moisés Michel Rosengaus Moshinsky

**Tuesday, 29 January**

09:00-09:15 Review of Day 1, Mr Oscar Arango

**SESSION III: Review of Donor Organization Activities and Priorities**

Chairman: Mr Tyrone Sutherland  
Rapporteur: Mr. Carlos Fuller

- 9:15-9:40      *Resource Mobilization for Development of NMHSs*  
(Francisco Villalpando, WMO)
- 9:40-10:00     Department of Foreign Affairs and International Trade, Canada  
(Patrick Quealey)
- 10:00-10:25    Caribbean Development Bank  
(Cheryl Dixon)
- 10:25-11:00    Break
- 11:00-11:25    World Bank Speaker (Walter Vergara)
- 11:25-11:50    Government of Italy  
(Laura Canuto)
- 11:50-12:15    Organization of American States  
(Cletis Springer)
- 12:15-2:00     Lunch
- 2:00-2:15      National Oceanographic and Atmospheric Administration  
(Doug Wilson)
- 2:15-2:45      Additional presentations
- Closure of SESSION III and Comments  
                  Tyrone Sutherland
- SESSION IV:      Examples of Regional Climate Activities**
- Chairman: Dr. John Zillman  
                  Rapporteur: Dr. William Westermeyer
- 2:45-3:30      1. Tyrone Sutherland, *Ongoing and Future Projects Implemented by CMO*
2. David Farrell, *Current and Planned Projects of CIMH*
- 3:30-4:00      Coffee Break
- 4:00-4:45      3. Emil Cherrington, *SERVIR*
4. Joseph McGann, *Mainstreaming Adaptation to Climate Change An Example of a Regional Climate Change Project with Observing Components*
- 4:45-5:45      Discussion
- 5:45-6:00      Review of Day 3 Agenda  
                  Dr. John Zillman and Carlos Fuller

## CLOSURE OF DAY 2

6:30–10:00 Evening Banquet

### **Wednesday January 30**

9:00 – 9:15 Welcome and Description of the Day's Activities

Carlos Fuller, Chairman

### **SESSION V: CAC Project Proposals for Climate Observations, 2008 – 2011**

9:15 – 10:30 Presentations on specific project proposals  
Introduction (Danny Foster and Cesar Toro)  
Presentations on five project proposals

Priority Projects introduced and discussed. Consideration of how projects help improve regional / national capacities, sustainable development

Donor representatives may wish to provide feedback, noting areas for improvement

10:30-11:00 Coffee Break

### **SESSION VI: Next Steps for All Participants**

11:00 – 12:30

1. Developing a road map for action (Zillman)
2. Wrap-up by Chairman (Zillman and Fuller)

12:30 – 2:00 Lunch

## MEETING PARTICIPANTS

**CENTRAL AMERICA AND CARIBBEAN ORGANIZATION INVITEES****Mr. Garfield Barnwell**

Director, Sustainable Development  
Caribbean Community (CARICOM)  
P.O. Box 10827  
Turkeyen  
Greater Georgetown, GUYANA  
Tel.: 592 222 0154  
Fax: 592 222 0174  
Email: [gbarnwell@caricom.org](mailto:gbarnwell@caricom.org) or  
[sdp@caricom.org](mailto:sdp@caricom.org)

**Mr. Emil A. Cherrington**

Water Center for the Humid Tropics of Latin  
America and the Caribbean (CATHALAC)  
801 City of Knowledge  
Panama City, PANAMA  
Tel.: 507 317 3223  
Fax: 507 317 3299  
Email: [emil.cherrington@cathalac.org](mailto:emil.cherrington@cathalac.org)

**Dr. David Farrell, Principal**

Caribbean Institute for Meteorology and  
Hydrology (CIMH)  
P.O. Box 130  
Bridgetown, BARBADOS  
Tel.: 246 425 1362 / 3 / 5  
Fax: 246 424 4733  
Email: [dfarrell@cimh.edu.bb](mailto:dfarrell@cimh.edu.bb)

**Mr. Carlos Fuller, Deputy Director**

CARICOM Climate Change Center (CCCCC)  
2nd Floor Lawrence Nicholas Building  
P.O. Box 563, Bliss Parade  
Belmopan, BELIZE  
Tel.: 501 822 1094  
Fax: 501 822 1365  
Email: [cfuller@btl.net](mailto:cfuller@btl.net)

**Dr. Marco González, Director Ejecutivo**  
Comisión Centroamericana de Ambiente y  
Desarrollo (CCAD)  
Boulevard Orden de Malta, No. 470  
Urbanización Santa Elena, Antiguo Cuscatlán  
EL SALVADOR  
Tel.: 503 22488843  
Fax: 503 22488899  
Email: [magonzalez@sica.int](mailto:magonzalez@sica.int)

**Dr. Kenrick Leslie, Executive Director**  
CARICOM Climate Change Center (CCCCC)  
2nd Floor Lawrence Nicholas Building  
P.O. Box 563, Bliss Parade  
Belmopan, BELIZE  
Tel.: 501 822 1104  
Fax: 501 822 1365  
Email: [kleslie1@caribbeanclimate.bz](mailto:kleslie1@caribbeanclimate.bz)

**Mr. Joseph McGann, Project Manager**  
CARICOM Climate Change Center (CCCCC)  
2nd Floor Lawrence Nicholas Building  
P.O. Box 563, Bliss Parade  
Belmopan, BELIZE  
Tel.: 501 822 1104  
Fax: 501 822 1365  
E: [caricomclimatechangecenter@yahoo.com](mailto:caricomclimatechangecenter@yahoo.com)

**Ms. Patricia Ramirez**

Comité Regional de Recursos Hidráulicos  
(CRRH)  
Sistema de la Integración Centroamericana  
(SICA)  
Del Super Boulevard en Rohrmoser, 500 m.  
norte, 200 m. oeste y 25 m. norte, casa de 2  
pisos a mano izquierda, portones negros.  
San José, COSTA RICA  
Tel.: 506 231 5791 ext 102  
Fax: 506 296 0047  
Email: [probando@ice.co.cr](mailto:probando@ice.co.cr) or  
[probando@racsa.co.cr](mailto:probando@racsa.co.cr)

**Dr Moisés Michel Rosengaus Moshinsky**  
Jefe de la Unidad del Servicio Meteorológico  
Nacional  
Coordinación General del Servicio  
Meteorológico Nacional  
Avenida Observatorio 192  
Colonia Observatorio  
Delegación Miguel Hidalgo  
11860 MEXICO, D.F.  
Tel.: + 52 55 2636 4603  
Fax: + 52 55 2636 4605  
E-Mail: [michel.rosengaus@cna.gob.mx](mailto:michel.rosengaus@cna.gob.mx) or  
[mickros@prodigy.net.mx](mailto:mickros@prodigy.net.mx)

**Mr. Tyrone Sutherland**, Coordinating Director  
Caribbean Meteorological Organization (CMO)  
69-71 Edward Street  
P.O. Box 461  
Port of Spain, TRINIDAD & TOBAGO  
Tel.: 1 868 624 4481  
Fax: 1 868 623 3634  
Email: [TSutherland@cmo.org.tt](mailto:TSutherland@cmo.org.tt)

**Mr. Cletus I. Springer**  
Coordinator  
Sustainable Energy and Natural Hazards Risk  
Management  
Department of Sustainable Development  
Organization of American States  
1889 F Street, NW  
Washington, DC USA 20006  
Tel.: 1 202 458 3148  
Fax: 1 202 458 3560  
Email: [CSpringer@oas.org](mailto:CSpringer@oas.org)

**Dr. Cesar Toro**  
Executive Secretary  
Intergovernmental Oceanographic  
Commission (IOC)  
Sub-Commission for the Caribbean and  
Adjacent Regions  
(IOCARIBE)  
Cartagena de Indias, Columbia  
Tel.: 575 664 6399 or 575 660 0407  
Fax: 575 660 0407  
Email: [C.Toro@unesco.org](mailto:C.Toro@unesco.org)

#### **DONOR ORGANIZATIONS**

**Mr. Norman Cameron**  
Caribbean Development Bank (CDB)  
PO Box 408, Widey  
St. Michael BARBADOS  
Tel.: 246 431 1600  
Fax: 246 426 7269  
Email: [cameronn@caribank.org](mailto:cameronn@caribank.org)

**Dr. Laura Fassio Canuto**  
Adviser, Ministry of Environment, Land & Sea  
Permanent Mission of Italy to the United  
Nations  
New York, New York USA  
Tel.: 1 646 840 5322  
Email: [canuto.laura@minambiente.it](mailto:canuto.laura@minambiente.it)

**Ms. Cheryl Dixon**  
Operations Officer (Development)  
Caribbean Development Bank (CDB)  
PO Box 408, Widey  
St. Michael, BARBADOS  
Tel.: 246 431 1701  
Fax: 246 426 7269  
E-mail: [dixonc@caribank.org](mailto:dixonc@caribank.org)

**Mr. Walter Vergara**  
Lead Engineer  
Environmentally and Socially Sustainable  
Development  
Latin America and Caribbean Region  
The World Bank  
1818 H Street, NW  
Washington, DC 20433  
Tel.: 1 202 458 2705  
Fax: 1 202 676 9373  
Email: [wvergara@worldbank.org](mailto:wvergara@worldbank.org)

**Mr. Patrick Quealey**  
Senior Policy Advisor  
Climate Change Division (GDCCP)  
Department of Foreign Affairs and  
International Trade  
Old City Hall (R2-08)  
111 Sussex Drive  
Ottawa, Ontario K1N 1J1 CANADA  
Email: [patrick.quealey@international.gc.ca](mailto:patrick.quealey@international.gc.ca)  
Tel. 1 613 944 7138  
Fax: 1 613 944 0064

#### **OTHER ORGANIZATIONS**

**Mr. Oscar Arango Botero**  
WMO Representative  
World Meteorological Organization (WMO)  
WMO Office for North America, Central  
America and the Caribbean  
San Jose, COSTA RICA  
Tel: (506) 258-2370  
Fax: (506) 256-8240  
Email: [OArango@wmo.int](mailto:OArango@wmo.int)

**Mr. Danny Foster**  
Consultant to GCOS & CCCCC  
7732 Castleisland Drive  
Sarasota, FL 34240  
Tel. : 1 941 378 1313  
Fax: 1 941 379 3536  
Email: [infotiempo@comcast.net](mailto:infotiempo@comcast.net)

**Ms. Diane Wade Moore**  
Local UNDP Representative  
United Nations Development Programme  
(UNDP)  
Belmopan, BELIZE  
Tel.: 501 822 2688  
Fax: 501 822 3364  
Email: [Diane.Wade@undp.org](mailto:Diane.Wade@undp.org)

**Mr. Steve Pollonais**  
Consultant to GCOS & CCCCC  
4 La Chaumiere, Maracas Valley, St. Joseph  
TRINIDAD & TOBAGO, West Indies  
Tel.: 1-868-663-2727  
Email: [srpoll@gmail.com](mailto:srpoll@gmail.com)

**Mr. Dick Thigpen**

Global Climate Observing System Secretariat  
c/o World Meteorological Organization  
7 bis, Avenue de la Paix  
P.O. Box 2300  
CH-1211 Geneva 2 SWITZERLAND  
Tel.: 1 301 598 5683  
Fax: 1 301 452 7669  
Email: [thigpen@erols.com](mailto:thigpen@erols.com)

**Dr. Francisco Villalpando**

Resource Mobilization Office  
Development and Regional Activities  
Department  
World Meteorological Organization (WMO)  
7 bis, Avenue de la Paix  
P.O. Box 2300  
CH-1211 Geneva 2 SWITZERLAND  
Tel.: 41 22 730 8309  
Fax: 41 22 730 8047  
Email: [FVillalpando@wmo.int](mailto:FVillalpando@wmo.int)

**Dr. William Westermeyer**

Global Climate Observing System Secretariat  
c/o World Meteorological Organization  
7 bis, Avenue de la Paix  
P.O. Box 2300  
CH-1211 Geneva 2 SWITZERLAND  
Tel.: 41 22 730 8083  
Fax: 41 22 730 8052  
Email: [wwestermeyer@wmo.int](mailto:wwestermeyer@wmo.int)

**Dr. John W. Zillman AO FAA FTSE**

Chairman, GCOS Steering Committee  
c/o Bureau of Meteorology  
GPO Box 1289  
Melbourne VIC 3001, AUSTRALIA  
Tel.: 61 3 9669 4250  
Fax: 61 3 9669 4169  
Email: [j.zillman@bom.gov.au](mailto:j.zillman@bom.gov.au)

**Dr. W. Douglas Wilson**

Co-Chairman IOCARIBE GOOS Steering  
Committee  
NOAA OAR / Chesapeake Bay Office  
410 Severn Avenue  
Suite 107A  
Annapolis, MD USA 21403  
Tel.: 1 410 267 5648  
Fax: 1 410 267 5666  
Email: [Doug.Wilson@noaa.gov](mailto:Doug.Wilson@noaa.gov)

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## GCOS IMPLEMENTATION IN CENTRAL AMERICA AND THE CARIBBEAN

**Carlos Fuller**  
**President WMO RA IV**

Gen. Alan Usher, Chief Executive Officer, Ministry of Natural Resources and the Environment, representing the Minister of Natural Resources and the Environment, Dr. John Zillman, Chairman of the Steering Committee of the Global Climate Observing System (GCOS), and Dr. Kenrick Leslie, Executive Director of the Caribbean Community Climate Change Center, distinguished participants, ladies and gentleman.

Welcome to the opening ceremony of the Meeting to Further the Implementation of the Regional GCOS Action Plan for Central America and the Caribbean. This meeting has been a long time in coming. I believe that Dr. William Westermeyer and I began discussing having this meeting in December 2006 in Nairobi at the Twelfth Session of the Conference of the Parties of the United Nations Framework Convention on Climate Change. At that time we were thinking of a meeting that would address the Regional GCOS Action Plans of both Central America and the Caribbean and South America. At the WMO Congress in Geneva in June 2007 we realized that was not happening and so we decided to concentrate on Central America and the Caribbean. On behalf of the Members of the southern part of the WMO Regional Association IV, I would like to thank the Government of Belize for hosting this meeting, and both the GCOS Secretariat and the staff of the Caribbean Community Climate Change Centre for organizing the meeting.

WMO Regional Association IV is comprised of Canada, the United States of America, Mexico, Central America, Colombia and Venezuela, and the Caribbean. France and the United Kingdom are also Members because they have territories within the Caribbean. The Members of RA IV have noted a significant decline in their weather and climate observing networks. This has had a significant negative impact in their ability to monitor weather and climate in the region, the basis for producing daily weather forecasts, warnings and other products for the various users of weather information such as aviation, agriculture, health, shipping and tourism, to name a few. During the past 10 years as the climate change community began to look for signals of climate change within the region and to study the potential effects of climate change, it also became aware of the scarcity of good, reliable, long term climate data within the region.

The region therefore welcomed the establishment of the Global Climate Observing System Action Plan and its regional components. They saw it as the mechanism to address the deteriorating networks. Unfortunately, implementation of the regional action plan has not been at the pace that we would have liked.

On behalf of all the National Meteorological Services of the region I would like to urge us all to examine the state of implementation of the action plan, reflect on its relevance, update it if necessary, but most importantly provide us with some guidance on how we will move the process forward. Among us today we have the regional executing and implementing agencies. Are there projects that you are interested in developing and implementing? We also have representatives of the funding community. Are there some activities within the Action Plan that fall within your portfolios? I believe that if we can get a few positive responses to these questions, our meeting would have been successful.

Once again I wish to thank the Government of Belize, the GCOS Secretariat, and the Caribbean Community Climate Change Centre for providing us with this opportunity to address this serious issue today

Thank you.

**OPENING SPEECH OF THE HONORABLE FLORENCIO MARIN  
BELIZE MINISTER OF NATURAL RESOURCES AND THE ENVIRONMENT**

**(Read by Mr Alan Usher)**

**Belize Biltmore Plaza**

**28–30 January 2008**

Distinguished members of the Diplomatic Corps, representatives of international and regional organizations, ladies and gentlemen.

It is a great honour for Belize to host this meeting to further the implementation of the GCOS Regional Action Plan for Central America and the Caribbean. Belize has always seen itself as the bridge between Central America and the Caribbean. Although physically we are on the Central American mainland, our shores are washed by the Caribbean and we have over 1,000 islands that are within the Caribbean. While Mexico and Guatemala are on our northern, western and southern borders and we have significant trade with these neighbours, culturally and politically, we have much more interaction with our friends in the Caribbean. So as we look north, south, east and west, we see that we have interests everywhere. As a result Belize has made the conscious decision to integrate with both sub regions. We were one of the founding Members of the Caribbean Community, CARICOM and later we joined the Central American Integration System, SICA. We were also a founding Member of the Caribbean Meteorological Organization, the CMO, and later we joined CRRH, the Central American Committee for Hydrological Resources because we recognized that we could contribute and benefit from being associated with organizations in both sub regions. Therefore, when the opportunity arises for an event to serve both sub regions, we believe that we are the obvious host.

Belize regards climate change as an extremely important issue that requires national, regional and global action. In 1992 I represented Belize at the United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil. The Presidents of Central America and I walked into the hall together and signed the United Nations Framework Convention on Climate Change. We wanted to show the international community that Central America would address climate change as a region. We later developed a Central American Climate Change Convention and we now have an active Central American Climate Change Committee within the Central American Convention on Environment and Development, CCAD. In 1995 we implemented the first regional project to conduct vulnerability assessments in the agriculture, coastal zone and water sectors. In May we will convene a Presidential Summit on Climate Change and the Environment in San Pedro Sula, Honduras.

Within the Caribbean, we have also recognized the importance of region coordination. Within CARICOM we coordinate our positions for the international climate change negotiations. In 1997 we implemented a GEF Stage I regional adaptation project, followed by a Canadian funded adaptation project and now we are coming to the end of a GEF Stage II adaptation project. We recognized the need to institutionalize these activities and are now hosting and supporting the Caribbean Community Climate Change Centre.

Belize has always recognized the importance of systematic observations to monitor the climate. This is an issue we have always followed closely in international negotiations and

have coordinated the position of the Group of 77 and China on this issue for the past five years. Our negotiators have always noted with alarm the deterioration in the global climate monitoring networks and the slow rate of implementation of the regional action plans. I therefore, welcome this initiative by the GCOS Secretariat and the Climate Change Centre to address this issue and to try to jump start some actions to strengthen our observing networks.

There is some good news to report already. Just last week in Belize we had the ground breaking ceremony to begin the civil works to prepare for the installation of our new Doppler weather radar. This will be an integral part of a regional radar project that is installing four new radars in the Caribbean and will be networked with existing radars in the Caribbean. This data will be shared with not only the regional and international meteorological community, but also with the emergency managers and the general public.

Am I setting the bar too high if I ask you to provide our regions with conclusions on Wednesday that include some project proposals with the commitments of the executing, implementing and funding agencies that will be developed and implemented in the upcoming months? It is my sincere desire to be able to present such conclusions to the presidential Summit in May with recommendations for the establishment of national mechanisms to facilitate the implementation of the projects.

I will therefore leave you now to allow you to begin these important deliberations and I wish you every success. I trust you will have some time to visit other parts of the country during your stay and urge the organizers to facilitate at least a short tour.

Thank you once again for coming to Belize and good luck.

## THE ROLE OF GCOS IN SUPPORT OF CLIMATE SERVICES AND CLIMATE CHANGE

**John W Zillman**  
**Chairman, GCOS Steering Committee**

The sponsors of the Global Climate Observing System (GCOS), the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC), the United Nations Environment Programme (UNEP) and the International Council for Science (ICSU), are grateful to the Caribbean Community Climate Change Centre (CCCCC) and the Government of Belize for agreeing to co-sponsor and host this meeting, which is aimed at accelerating the implementation of GCOS in the Central American and Caribbean (CAC) region.

As Chairman of the WMO-IOC-UNEP-ICSU joint Steering Committee for GCOS, I am particularly grateful to the Executive Director of the CCCCC, Dr Ken Leslie, and the Deputy Director, Mr Carlos Fuller, who, as President of WMO Regional Association IV, delegate of Belize to sessions of the Conference of the Parties to the UN Framework Convention on Climate Change (UNFCCC), and in various other capacities has already played a key role in GCOS planning for the region, including, especially, leading the preparation of the 2003 GCOS Regional Action Plan.

The agenda for this meeting and the urgency of implementing an effective climate observing system for the region result from the fundamental importance of climate observations for essentially all aspects of the national and international response to the climate issue, including both living with the natural variability of climate and responding to the challenges of human-induced climate change.

Reliable, comprehensive climate observations are required for many purposes including, in particular:

- climate system monitoring;
- climate change detection and attribution;
- operational climate prediction on seasonal-to-interannual time scales;
- research to improve understanding, modelling and prediction of the climate system;
- applications and services for sustainable economic development;
- assessment of the impacts of, and vulnerability and adaptation to, natural climate variability and human-induced climate change; and
- meeting the requirements of the UNFCCC and other international conventions and agreements.

At the global level, GCOS is designed to meet these needs through its role in underpinning a wide range of international climate monitoring, research, applications, services, assessment and policy development programs and initiatives including, especially:

- The World Climate Data and Monitoring Programme (WCDMP);
- The World Climate Research Programme (WCRP) and the International Geosphere-Biosphere Programme (IGBP);
- The World Climate Applications and Services Programme (WCASP);
- The World Climate Impacts and Response Strategies Programme (WCIRP);
- The WMO-UNEP Intergovernmental Panel on Climate Change (IPCC); and
- The UN Framework Convention on Climate Change (UNFCCC).

GCOS is not however, a separate self-contained, purpose-specific observing system. Rather it is an integrated global 'system of observing systems' composed of the climate-relevant components of the various established global observing systems of its sponsors, strengthened, supported and co-ordinated as necessary to meet the totality of international and national needs for climate and climate-related data for all the purposes listed above. It is built particularly on:

- the WMO World Weather Watch Global Observing System (GOS) and the Global Atmosphere Watch (GAW);
- the IOC-led Global Ocean Observing System (GOOS); and
- the FAO (Food and Agriculture Organization)-led Global Terrestrial Observing System (GTOS);

with its networks structured hierarchically according to scale and purpose and including, especially:

- Reference Networks;
- Baseline Networks (especially the GCOS Surface Network (GSN) and GCOS Upper Air Network (GUAN));
- Comprehensive networks (such as the Regional Basic Climate Networks of the World Weather Watch);
- Detailed National Operational Networks; and
- Research networks.

The national counterparts of WMO, IOC, UNEP and ICSU have been progressively implementing GCOS since the early 1990s but, in many parts of the world, it has proved difficult or impossible to obtain the necessary additional resources or achieve the national and regional coordination that is essential for effective progress. In 2000, on the initiative of the UNFCCC, and with UNDP (United Nations Development Programme) and other support, the GCOS Secretariat organised a series of regional workshops culminating in GCOS Regional Action Plans developed by the key climate observing experts in each of ten regions. The GCOS Regional Action Plan for the CAC region was completed in 2003 but only limited progress has been possible, so far, with its implementation.

On order to move to the next stage of accelerated implementation and delivery of the substantial benefits of an effective CAC-GCOS within a 5-10 year time-frame, it will be necessary to build particularly on the work of the National Meteorological and Hydrological Services (NMHSs) and other national and regional organisations with an interest in, and responsibility for, climate issues via:

- establishment of an appropriate CAC-GCOS coordination mechanism under the broad auspices of the GCOS sponsors;
- regular progress assessment and updating of the CAC-GCOS Regional Action Plan (RAP);
- enlisting of external donor support to accelerate the implementation of critical components of the GCOS RAP; and
- involving all stakeholders in coordinated implementation action in the region;

The challenge for this historic meeting will be to develop a road-map for CAC-GCOS and to ensure that the necessary understandings for follow-up action are established and supported by all the climate stakeholders in the region.

## A GCOS REGIONAL ACTION PLAN FOR CENTRAL AMERICA AND THE CARIBBEAN

### Executive Summary

May 2003

This GCOS Regional Action Plan for Central America and the Caribbean (CAC) sets out a framework for improving systematic monitoring of the climate system<sup>4</sup> in the region, within the context of GCOS and country commitments to the UNFCCC and with respect to regional priorities. The specific goals of the Action Plan are to:

- Identify GCOS requirements for systematic observations of the climate system from the Caribbean and the adjacent countries of Central America;
- Outline a strategy to address these needs;
- Contribute to meeting national needs for observational data; and
- Enhance coordination between observational programs and initiatives within and external to the region.

Beginning with an overview of the current state of climate observing programs, networks and data management and exchange in the region, the Regional Action Plan draws attention to areas where deficiencies exist or further development is needed to meet GCOS requirements. It also highlights some regional priorities that lie outside the fairly restrictive definition of GCOS requirements. The Plan then outlines a series of strategic thrusts and related projects and recommendations aimed at enhancing the capacity of the nations of the Caribbean and Central America to meet GCOS requirements for high-quality climate system observations and related products. These initiatives will also assist in meeting regional needs for systematic observations of the climate system to support national and regional planning for adaptation to climate change, climate variability, and climate extremes and for sustainable development.

Within the CAC region, inadequate coordination between the many agencies and institutions involved in climate system observations and related data management, exchange and archiving was identified as a major shortcoming. This represents a critical issue where GCOS implementation is concerned. The Action Plan, therefore, recommends that the following steps be taken:

- Enhance regional coordination, building upon and reinforcing existing regional institutions and structures such as the regional data centers in Barbados and Costa Rica, CPACC/ROMAC and SIDS projects, the National Meteorological Services and other bodies.
- Designate national GCOS Focal Points in all countries of the CAC region. These individuals should promote enhanced coordination and collaboration both between national agencies and institutions involved in the implementation of climate change policies and programmes and climate research and monitoring programs and at regional and international levels.

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<sup>4</sup> The climate system encompasses atmospheric, oceanic and terrestrial components.

- Establish a regional GCOS panel comprising at least two representatives from each country. These should include the national climate change focal point and one or two representative (s) of the meteorological, hydrological and oceanographic services.
- Create a "virtual" regional coordination center, assigning specific coordination functions to various institutions according to their capabilities, experience, institutional strengths, and philosophy.

In addition, the Action Plan proposes that the following specific projects be implemented to address needs and deficiencies identified under four planning elements:

### **Planning Element 1 - Observing Programs and Networks**

#### **a. The Atmosphere**

- Project 1. Enhance the GCOS Surface Network (GSN) and GCOS Upper Air Network (GUAN) of the Central America / Caribbean Region.
- Project 2. Replace the Telecommunication Equipment of the national Meteorological Services in the Caribbean - Central America region.
- Project 3. Establish a Regional Air Quality Station to measure ozone and Ultraviolet-B radiation.
- Project 4. Ensure the sustainability of the Regional Technical Support Center

#### **b. The Oceans**

- Project 5. Consolidation of the tide gauge network in Central America and the Caribbean.
- Project 6. Pursue implementation of IOCARIBE-GOOS. (Project to be developed)

#### **c. Terrestrial Systems**

- Project 7. Undertake a regional assessment of monitoring networks for surface water and groundwater, identify network gaps and other deficiencies, and prepare recommendations to address these needs.
- Project 8. Establish a regional monitoring system for natural ecosystems based on existing national and regional observing and monitoring sites and networks.
- Project 9. Establish a system for monitoring land cover change for use in determining carbon emissions and regional modelling of climate change scenarios in Central America.

### **Planning Element 2 – Access to Data and Metadata**

- Project 10. Undertake recovery and digitization of perishable historical atmospheric, oceanographic and terrestrial climate records for locations within the region.
- Project 11. Establish a regional data warehouse charged with responsibility to develop, maintain and update a catalogue of data, thereby enabling users from the CAC countries to select the most appropriate datasets for their purposes.

### **Planning Element 3 - Regional Coordination**

- Project 12. Create a programme which will foster the coordination of activities related to the development of the regional Global Climate Observing System.

#### **Planning Element 4 – Education, Training, Capacity Building and Awareness Building**

- Project 13. Plan and conduct a series of workshops aimed at developing improved awareness of the science of climate change, its impacts on the countries of the Caribbean and Central America, and the potential for mitigating and adapting to these impacts.

It is hoped that this GCOS Regional Action Plan will prove effective in focussing regional energies on meeting GCOS and related requirements, improving coordination and gaining the support of governments and donors for investments in infrastructure and capacity building in the Central America and Caribbean region. Demonstrating the many important applications of climate system data (e.g. in socioeconomic, engineering and environmental planning and design; the development of improved predictive capacity on seasonal to inter-annual time scales; etc) will assist in generating the support needed to sustain observational programs and ensure the long-term continuity and accessibility of vital climate records.

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## AN ANALYSIS OF THE GCOS ACTION PLAN IN THE CAC REGION AND ITS INTENDED IMPACTS

Steve Pollonais

### Introduction

This paper focuses on those activities that would enable the countries in the Central American and Caribbean region to fulfill their climate change responsibilities under the UNFCCC. Efforts at adaptation to Climate Change require a change in focus and guided capacity building if this goal is to be achieved.

### The Need for Data

In this situation, focus must be placed on the value of data in our quest for a meaningful contribution to our climate change responsibilities (be they legal or moral). The availability of monitoring equipment (for data acquisition), along with training and exposure to regional climate models in downscaling, interpretation and validation, is of paramount importance to this effort. Telecommunications (local, regional and international) must also play an important role in the exchange of information in order to assist in the development of holistic approaches to climate research.

### Approach

An exercise was undertaken to poll Members as to their needs as identified in the GCOS Regional Action Plan's 13 priority areas for regional improvements in the data collection network, the completion of which could lead to a significant step forward in the climate monitoring process as promoted by the UNFCCC. Feedback obtained was somewhat disappointing; however, with the assistance of an experienced contract officer in constructing climate project proposals, a list of priorities was developed for attracting potential donors. While the theme of Climate Change is now attracting worldwide attention among a widening cross-section of audiences, it could be anybody's guess as to what the response to the call for sponsorship will be. So far, those areas that have attracted a response from the region to our questionnaire were, in order of priority, a need for:

- (a) Climate Change Awareness Development Workshops;
- (b) Support for a Regional Technical Support Centre;
- (c) Data Rescue programmes;
- (d) Establishment of Regional Air Quality Stations.

From where this consultant stands, missing from the selections (probably as a result of the paucity of the sample) is the need for more attention to the area of surface and upper air observing networks with attention to Essential Climate Variables (ECVs) and network density. It would also appear that selection (d) above although valuable, does not really carry the weight of selection due to the very nature of the variable and could be replaced. UV radiation monitoring needs can be satisfied with spot sensors across the Caribbean and Central America and thereby not be in any great need for extensive donor attention. Also, with the exception of Trinidad in the South-eastern Caribbean Puerto Rico in the north and Cuba in the Northwest, the CAC region is not heavily industrialized. This leaves in its wake the selection of a project for application in the Marine environment (an IOCARIBE application) and another in Database Management for final inclusion in this programme – a total of 5 projects.

In terms of data exchange, telecommunications systems in the CAC region, in most part, have become rather sophisticated. Full use is now being made of the acquisition of raw data via satellite transmissions that also now carries the ability to process these data through the use of computer workstations of one manufacturer or another. A worry however, remains with the telecommunications among the small aeronautical offices of the Caribbean and Central American region where the internet has replaced these systems in large measure. This situation however needs to be strengthened.

### **Status**

Environmental data currently exists in many forms and locations in the CAC region. Some data sets are of medium term and are archived in various centers - mostly governmental. The greatest challenge here remains the harmonisation of these disparate collections under one central entity, both nationally and regionally, for the efficient utilization and application of information in research and other investigative pursuits. In some cases, institutional barriers have been erected that militate against the free exchange of data due to a perceived desire for protection against commercial raiding of what is considered a value added national resource. Unfortunately, such barriers also work against a much-needed synergy between public sector agencies in achieving desirable goals for national development. The solution therefore, lies in the effective removal of such barriers, without compromising the security of data gathered at public expense, to private profit-oriented enterprises.

Against such considerations lie the responsibility of Governments towards their national Climate Change agendas and the need to develop the necessary infrastructure for future activity in this area. Fortunately, the Caribbean has only recently emerged from a regional project in Meteorology and Climatology that has addressed many of these concerns. *The SIDS-Caribbean Project*, A WMO executed, Finnish Government sponsored initiative has intervened in the region in areas such as International and Regional Telecommunications, Observing Networks rehabilitation (Instrumentation), Maintenance and Calibration facilities, Database Management, Data rescue, Training and Awareness Building. This current capacity in the meteorological services for participation in systematic observations is seen as an area of growth; however the following shortcomings hinder progress in this area.

### **Shortcomings and possible Solutions**

- Network density - This consultant recognizes the need for an extension of this monitoring system with the support of modern technology.
- Data Quality - A programme of maintenance and calibration of meteorological/hydrological instrumentation.
- Data collection - Where possible, the use of modern telemetry communication should be decided upon and implemented.
- Observational frequency - can be adjusted with the view towards a meaningful interpretation of data and an increasingly valuable support for climate models.
- Database Management - The need for common software for the maintenance of climatological records.
- Data Rescue equipment and programmes - for the arrest of data losses. Data Rescue applications have the value of rescuing data from scattered archives for use in climate applications. Short data sets can be made long with the wise use of data so acquired.

## **Further Problems/Solutions**

- The existence of many diverse rainfall data managers. The rain gauge network ideally should be controlled by one utility. In many cases multiple networks have resulted in a duplication of efforts and a corresponding waste of both human and financial resources and should be corrected.
- The non-sharing of rainfall data. This problem is mostly associated with the existence of multiple networks. Information sharing is vital to any successful venture in the sciences and must be encouraged at all costs.

## **Hydrological Networks**

In the tropics, especially with island environments, water resources are critical. In the Caribbean, availability of potable water and water for agricultural/industrial applications is constrained by limited ground water supplies and stored water in dams.

Water Resources Agencies carry out hydrological operations. Rainfall data are collected through rain gauge networks and in some cases (as in Cuba) with the assistance of radar equipment. Happily, this option will soon be available to the Caribbean islands. With this come the additional advantages of rainfall mapping, drainage and flood monitoring, agricultural support in the area of rainfall distribution monitoring, and low amplitude weather events warnings.

In many countries, questions lie with the density of the rain gauge network, the method of data collection (whether manual or automated), the frequency of data collection, the maintenance and calibration of instruments and the adequacy of statistical data processing.

## **Training**

The question of training is central to all national data management systems. For this plan to be successful, training must be addressed with the identification of all capable and qualified people and adequate training facilities.

- Database Management – Training is essential in the use of software selected for climate change applications.
- Hydrology – Guidance should be acquired from the WMO Carib-Hycos programme. Requisite training to follow.
- Training for climatologists/hydrologists in statistical analysis for use in the manipulation of data into climatological/hydrological information.
- Training in the maintenance and calibration of equipment. This may necessitate the further development of calibration facilities at selected locations within the CAC region.

## **Climate Models**

The utilization of existing climate models and/or the development of such models pertinent to the Central American and Caribbean region are of utmost importance if we are to make use of the high quality data sought after in this effort at sponsorship. The region must be in a position to project changes in climate if meaningful decisions are to be made for our economic and security situations of the future. Currently the major established climate models are Global ones whose resolutions are far too coarse for small island projections. It is therefore vital that such global models be downscaled for regional use but this requires special training. Training therefore may be accessed through arrangements with NOAA or the UK Met Office/Hadley Centre or at some recommended climate institution. Serious consideration should also be given to the training facilities in Cuba although limitations in language may exist for some countries. Currently efforts are underway at the University of the West Indies St. Augustine Campus in Trinidad and Tobago, adding to initiatives already

in train at both the Mona and Cave Hill campuses, to install and operate the UK/PRECIS model with the help of Cuban experts. A regional workshop is to be initiated in late February or early March 2008 at St Augustine, Trinidad, utilizing the computer resources of that campus to train both faculty and graduate students in the downscaling of the model. Training in the downscaling of this model for Caribbean locations is envisaged as part of the university's climate change development training programme.

### **Record Keeping**

This is to be considered in the national context. Central statistical offices in every country could be utilized as official national repositories (warehouses) of all Climate and Climate Change information. Data should be transferred to these repositories on a routine and regular basis. At governmental levels policies are necessary to enable the free exchange of data to regionally accredited scientific research institutions.

### **Education and Awareness Building**

There remains the question of the development of a programme on Climate Change information and outreach. Meteorological Services must regard themselves as one of the primary vehicles for information dissemination especially in the area of Climate Change. Partnerships with Government's National Environmental Organisations, the Media, and Educational organizations from the primary to the tertiary level, must be enlisted in order to get the message out. The student body however remains the most promising group to target for the best results. Through strategies such as school visits, lectures, projects, seminars, environmental competitions, newspaper and journal articles, websites, tours to meteorological and hydrological facilities and an insistence on the inclusion of Climate Change topics in school curricula can this challenge be met effectively.

Decision-makers in the society are not always alert to fully appreciate the special technical needs of scientific oriented agencies. Most times the average senior public official advances his career through the administrative ranks of the Public Services with little background, exposure or appreciation for technical/scientific matters. Unfortunately, it is those very same decision makers that influence the annual operating budgets of these technical offices under their responsibility. There is therefore need for sensitization of these officials in the scientific nuances that dictate the missions of these agencies. Further to this, is the need for an increased visibility of such technical organizations if they are to bring the wider public on board as stakeholders. The following strategies are recommended for use as possible solutions.

- The use of Seminars as a vehicle for the enlightenment of decision-makers
- Involve the media in Climate Change activities. An insufficiently informed media can work at counter purposes to the Climate Change effort. The media must be seen as a powerful partner in getting the story out and the education and sensitization of the population. Seminars are also recommended to address this need.
- Use of Websites. Develop Internet websites for access by the public, government agencies, educational institutions, industry and other areas of economic and social activity. Websites are very effective instruments of information access. Such information dissemination is necessary to garner public interest.

### **Our Social Responsibility**

The Climate Change question has been with us for several decades now with some encouraging responses becoming evident over the last two decades or so. The Montreal and Kyoto protocols are relatively recent efforts seeking to corral the international community into responsible behaviour with respect to the indiscriminate dumping of carbon into the environment. In spite of a growing body of evidence that supports global warming, there remain international communities that are delinquent with regard to their high levels of

Greenhouse Gas emissions into the atmosphere, seemingly without a sense of conscience in the face of widespread environmental degradation. Small Pacific islands (atolls) are in the direct line of fire and would be the first to disappear under rising sea levels. The future looks bleak for us small islanders as our livelihoods and ways of life are increasingly threatened. This threat extends to food production, tourism, coastal zones, water resources, health, recreation, increased vulnerability to natural disasters and the loss of the very land space that we occupy. What pray tell me would be the outcome of this inexorable march to an unknown and uncertain future – mass migrations? An 11,000 Tuvaluan population has already had the bitter experience of the rejection of this option by the Government of New Zealand.

We as people, especially people in the scientific community must mobilize ourselves into lobbies aimed at sensitizing and awakening our political leaders. Pressure must be made to bear on industrial developers, commercial entrepreneurs and the like, to change what can only be described as a myopic view of the world and be made to see that the fallout that we speak of, awaits them also. In other words, they must be told that the future that awaits them due to a changing climate would also be very bad for business. As the saying goes “The environment that we despoil today was given to us in trust from our children. Are we good tenants?”

However, one notes with satisfaction that the Nobel Committee found it appropriate to recognize two sources of work in Climate Change for the award of last year’s (2007) Nobel Peace prize. Former US Vice President Al Gore for his compelling documentary “An Inconvenient Truth” and the prestigious Intergovernmental Panel on Climate Change (IPCC) based in Geneva were worthy recipients and bring into focus the increasing seriousness with which the topic is being treated. The skeptics it would appear are slowly being converted and the question that remains more and more is not “if” but “when”. Through the use of increasingly accurate regional climate models utilizing better resolutions and better data, one hopes to answer this question in the relatively near future, adequately.

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## THE PROVISION OF ADDITIONAL AND BETTER UPPER AIR OBSERVATIONS TO CLIMATOLOGICAL CENTERS\*

### A PROPOSAL

#### Introduction

Climate change is a growing factor in the plans and activities of society in the Central America and Caribbean (CAC) region. This leads to greater demands on climate centers within the region to provide more specific information on the type and amount of climate change expected over a wide range of horizons. The observing systems and networks in this region are not currently adequate for these new and growing demands. The centers require more and higher quality observations of the atmosphere in order to begin to satisfy the new demands. In fact, a climate observing network designed specifically for climate purposes does not exist. This is particularly true of the upper air (balloon-borne) observing network. This proposal specifically addresses the weaknesses and needs of the upper air network.

The centers depend on the networks included in the Global Climate Observing System (GCOS), which in reality is an eclectic mix of networks and observations designed primarily for other purposes. The Caribbean, Central America, and Mexico have 6 observatories that are included in the GCOS Upper Air Network (GUAN) in this region. There are, in addition, 13 upper air observatories that do not participate in the GUAN network but that are included in the broader Regional Basic Climatological Network (RBCN). In view of the needs for additional climate observations for developing effective policies for adaptation to climate change, the upgrading of both the 6 observatories and of these additional 13 observing points is of major importance.

#### Proposal

This proposal seeks the funds needed by 10 national governments in the CAC region to supplement the growing costs of performing upper-air observations over a 4 year period. The 4 year period allows the national governments time to consider and increase their budgets to accommodate these costs. The national governments have indicated they will fund the added personal and infra-structural costs that accompany the actions of this proposal. The 10 participating recipient countries in this proposal are:

Bahamas	Barbados	Belize
Colombia	Costa Rica	Dominican Republic
Jamaica	Mexico	Netherland Antilles
Trinidad		

The total funds requested for the proposal are US \$5,148,000.

#### Benefits

The added and improved observations described in this proposal will benefit:

- All existing and planned donor projects concerning climate change and adaptation to climate change;

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\* RBCN added in this version of proposal.

- The climate modeling capabilities of global and regional centers--major beneficiaries;
- Efforts to recognize and forecast periods of extreme weather such as flooding, excessive periods of rain, and droughts;
- Identification of the generation and movement of tropical storms;
- Weather forecasts and annual outlooks supporting public expectations, national governments, and industry, both large and small, provided by National Meteorological Centers; and
- Long-range forecasts of the El Nino/Southern Oscillation phenomenon, which in turn benefits agriculture, energy planning, commercial fishing, and tourism.

## **Background**

As the need for more and better information from our national meteorological and hydrological services has increased over the years, national budgets have remained about the same. National services in the region have tried to change their priorities where they can to accommodate these new demands, and, in some cases, have received short-term financial support from other governments or donor organizations. However, all of these attempts and actions fall short of the support that is needed to provide more and better data and guidance.

The upper air observatories in this region have performed reasonably well over the years in providing routine and standard weather observations to the national, regional, and global centers. However, the new demands of climate-related activities cannot be satisfied by the national observatories unless their budgets are increased dramatically and their priorities and goals are shifted more towards the needs of the climate community. In nearly all the countries concerned an increase in funding can only come from external support. The USA provides support to the national upper-air programs in the Caribbean and Belize because they need the observational data to identify and forecast hurricane activities in the region. However, this support is not sufficient to assist the national meteorological services in meeting the increasing climatological requirements.

Currently the GUAN observatories perform one observation per day unless the National Hurricane Centers ask for additional observations during tropical storm events. The routine observations are performed in the morning and usually reach an altitude of 75,000 feet.

## **Climatological Center Requirements for Upper-Air Observations**

There are two primary requirements for the GCOS Global Upper-Air Network (GUAN). One is to perform two observations per day and the second is to have the balloons reach heights of 115,000 feet. Neither of these requirements are being satisfied by the upper-air observatories in our region.

There are six upper-air observatories in our region that are part of the GCOS GUAN:

Juan Santamaria Airport, San Jose, Costa Rica  
 Phillip Goldston Airport, Belize City, Belize  
 Grantley Adams Airport, Barbados  
 Hato Airport, Curacao, Netherland Antilles  
 Norman Manley Airport, Kingston, Jamaica  
 Manzanillo, Colima, Mexico

In addition to upgrading the above 6 stations, the following 13 upper air observatories should be upgraded to GCOS standards:

Bahamas, Nassau Airport	St Maartins, N.A., Juliana Airport
Trinidad, Piarco Int. Airport	Dominican Republic
Mexico, Chihuahua	Mexico, Acapulco
Mexico, Monterrey	Mexico, La Paz
Mexico, Mazatlan	Mexico, Merida
Mexico, Mexico City D.F.	Mexico, Vera Cruz
San Andres Isle, Colombia	

#### **Requirement for two observations per day:**

The primary reason our meteorological services cannot satisfy this GCOS upper-air requirement is the lack of funds. The cost of the expendable supplies (instruments and medium-sized balloons) for a single observation costs approximately \$150.00. This does not include the costs for personnel, hydrogen generators, spare parts, maintenance, and communicating the observations to other meteorological services in our region and to the global centers.

The balloons are filled with hydrogen gas which is generated each day at the observatories. Increasing the number of observations to two per day will mean the generators have to work twice as much each day and that they will require more maintenance and spare parts.

#### **Requirement for the observations to attain heights of 115,000 feet**

The upper-air observatories in our region use either 350- gram or 500-gram balloons and usually reach heights of 75,000 feet above sea level. This meets the minimum requirement for normal weather forecasting and for tracking tropical storms. However, climate data are needed in the stratosphere to monitor changes in the atmospheric circulation and to study the interaction between stratospheric circulation, composition and chemistry. GCOS wants the soundings to reach heights of 5 hectopascals (hPa) or roughly 115,000 feet above sea level. Balloons in the size range of 1000 grams to 1200 grams will increase the heights to over 100,000 feet reliably.

The size of the balloon dictates the height of the sounding, and the cost of the balloon increases with the size.

The cost of the 350- or 500-gram balloons is in the range of \$US15.00 to \$US25.00 each. The cost of larger balloons such as 1000- or 1200-gram balloons is roughly \$40.00 to \$50.00 each. The cost varies considerably according to the number of balloons being purchased.

The larger balloons will require more hydrogen gas, which adds to the workload on the existing generators. Additional spares and replacement parts must be considered for the hydrogen generators and their auxiliary equipment.

#### **National Needs**

Bahamas, Barbados, Belize, Jamaica, Dominican Republic, Trinidad, Curacao, St Maartens, and Colombia

The observatories in these 9 countries are part of the USA/NOAA Hurricane Upper-air Network, and, as such, they receive support for one observation per day. The NOAA support includes the airborne instruments (radiosondes), balloons, and limited assistance for their hydrogen generators. This proposal asks for support to provide the expendables and some spares for the hydrogen generator to do one additional observation per day.

### **Costa Rica**

Costa Rica has difficulty in funding and purchasing the required instruments and balloons and often seeks support from other governments and donor organizations to assist it in its upper-air program. This proposal asks for support for 2 observations per day as well as some spares for their hydrogen generator.

### **Mexico (8 Observatories)**

Eight upper air observatories in Mexico reliably perform one sounding per day. This proposal increases the soundings to two per day at all 8 observatories using the larger balloons.

### **Details and Budget Explanation**

In practice, 400 radiosonde instruments and 400 balloons are considered to be a one-year supply for one observation per day. This allows for failed attempts and for additional observations required for special meteorological situations such as hurricanes.

This proposal is projecting the cost of a radiosonde instrument to be \$125.00. Bulk purchases and negotiations with the supplier will likely drive this cost down by 10%. Thus the cost for 400 instruments is projected to be \$50,000 less 10% or \$45,000.

The cost of balloons can vary by as much as 25% according to the supplier and the number of units being purchased. This proposal will use \$45.00 per balloon for cost projections without considering possible reductions for bulk purchases. This proposal will use \$18,000 for the cost of 400@ balloons in the 1000/1200 gram size.

The hydrogen generators and auxiliary equipment including the needed water filtration systems can be maintained successfully on an annual basis for approximately \$1500.00. This does not include the replacement of system modules or major repairs.

**ANNUAL COSTS  
US\$ x 1000**

<b>Observatory Country</b>	<b>Expendables for 1 obs per day 400 @ annually</b>	<b>Expendables for 2 obs per day 800 @ annually</b>	<b>Hydrogen Gen &amp; Auxiliary Equip.</b>	<b>TOTAL \$ x 1000</b>
Bahamas	63.0		1.5	\$64.5
Belize	63.0		1.5	64.5
Barbados	63.0		1.5	64.5
Colombia	63.0		1.5	64.5
Curacao	63.0		1.5	64.5
St Maartens	63.0		1.5	64.5
Dominican Rep	63.0		1.5	64.5
Jamaica	63.0		1.5	64.5
Mexico (9 sites)	567.0		13.5	580.5
Costa Rica		126.0	1.5	127.5
Trinidad	63.0		1.5	64.5
<b>TOTALS</b>	<b>1134.0</b>	<b>126.0</b>	<b>27.0</b>	<b>\$1287.0 K</b>

**4-YEAR BUDGET  
US\$ x 1000**

<b>Observatory Country</b>	<b>Expendables for 1 obs per day 400 @ annually</b>	<b>Expendables for 2 obs per day 800 @ annually</b>	<b>Hydrogen Gen &amp; Auxiliary Equip.</b>	<b>TOTAL \$x1000</b>
<b>19 Observatories</b>	<b>4536.0</b>	<b>504.0</b>	<b>108.0</b>	<b>\$5,148.0K</b>

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**ADAPTING TO CLIMATE CHANGE:  
RAISING AWARENESS IN CENTRAL AMERICA AND THE CARIBBEAN**

**A PROPOSAL**

**Introduction**

The Central America and Caribbean (CAC) region is particularly vulnerable to climatic changes due to their dependency on natural resources and climate sensitive sectors, such as agriculture and fisheries, and their limited capacities to anticipate and respond to climatic changes. While their dependencies will not change during the foreseeable future, their capacity to anticipate and respond to climate change can be strengthened significantly. Adaptation on all levels of society is the key to mitigating the adverse effect of climate change.

Adaptation to climate change is a growing factor in the considerations and plans of all levels of our societies, and the need for more and better information on how our climate is changing is paramount to adapting to climate change. National Meteorological and Hydrological Services (NMHSs) and regional and global climate centers must interact with national planners to raise their awareness and to provide solid and quantified information on local and regional climate change.

The NMHSs in the CAC region are not fully prepared to provide this support, and the users and potential users of climate information are not sufficiently aware of the wide range of impacts of climate change and/or of how to adjust to or mitigate these impacts.

In this proposal “**Raising the Awareness**” addresses two distinct groups with differing needs but common goals:

**The Scientific Community.** The NMHSs of the region must become more aware of the activities and advances of modern science in identifying, quantifying, and, in some cases, forecasting climate change. The NMHSs must learn how to use these new tools and apply them to the national needs.

**The Counties and Region.** The awareness of impending or potential changes in climate must be elevated in all sectors of society, including government, industry, education, and the general population. The countries will be made aware of modern technologies and existing programs to assist them in building a sustainable capacity to adapt to climate.

**Participants and Scope**

All of the Caribbean island nations and all 7 countries of Central America

**Strategy**

This proposal is intended to generate action among the participating countries and to assist in laying the foundation for a sustainable capacity to adapt to climate change. The implementation of this proposal will require 18 to 24 months.

Education, training, and public awareness will be used to facilitate the capacity building that is needed to assist the countries in performing their responsibilities of mitigating the adverse effects of climate change.

Knowledge of the science of climatology will be strengthened in NMHSs to prepare them to lead their particular countries in implementing this proposal.

The executing agencies of this proposal will be the Caribbean Community Climate Change Center (CCCCC) in Belize and Water Center for the Humid Tropics of Latin America and the Caribbean (CATHALAC) in Panama.

Many countries and regions have developed strategies, programs, initiatives and projects aimed at managing climate change. This proposal draws on the efforts and successes of those countries to assist this region in developing the basic building blocks for effective climate change management.

Workshops, seminars, and educational Web programs will be the primary tools for providing the needed education, training and, public awareness. These will be conducted by experts from international organizations or other countries that have successfully planned or implemented the fundamentals of climate management.

### **Benefits**

The obvious beneficiaries of this proposal will be the nations of the region. Research on all scientific and technical levels has concluded that governments with strong and proactive internal organizations that are specifically responsible for the management of climate change have the best chance of reducing the adverse effects.

Industry, including agriculture, shipping, fishing, mining, and tourism will benefit by learning more about the specifics of climate change. They will also benefit from being informed of how similar industries in other countries or parts of the world have planned and reacted to the changes that directly impact their operations and profits.

Education in primary, secondary, and advanced levels of education will be an important part of this proposal. The commitment and enthusiasm of young people will be essential to meeting the challenge of global change. We must ensure that they have the tools and the information they need to make informed decisions about their lives and their communities.

Donor organizations will benefit because this proposal will play a key role in making their existing and new projects and initiatives less vulnerable to climate change. This proposal will help stabilize the effects of climate change in a community which allows the donors to be more definitive and accurate in determining the impact on their activities. **Notably, roughly a quarter of the World Bank's lending is in climate sensitive sectors.** Climate change has the potential to impact most of its development work and, in some cases, possibly reduce its intended benefits. This proposal will benefit the GEF strategic priority "Piloting an Operational Approach to Adaptation." The Global Environment Facility (GEF) supports projects that provide real benefits and that may be integrated into national policies and sustainable development planning.

There are active committees and groups that are heavily involved in assisting the region in adapting to climate change. This proposal contributes to their efforts and, at the same time, benefits from their experiences and support.

## **Components and Description of Activities**

This proposal is separated into 3 components that are not necessarily stepwise and can be implemented simultaneously or in concert with other influencing activities.

### **1. Preparation of the Science Community**

Representatives from CCCCC and CATHALAC will assist the NMHSs in planning and arranging these workshops. The NMHSs, in coordination with cooperative climate centers, will invite experts from climatological centers, academia, donors, and other scientific organizations that are involved in climate change. These experts will design and conduct a series of workshops or symposiums aimed at achieving the following:

- Assisting the NMHSs in identifying and quantifying climate change for the particular country. This will be done based on the best information and technology available.
- Assessing the capabilities of the NMHSs and supporting climate centers.
- Raising the awareness of the NMHSs and centers to modern techniques and programs
- Determine what training is needed to prepare the services and centers to take full advantage of the new techniques and programs.

### **2. Coordination of Science and Society “Stakeholder Workshops”**

These workshops will join the scientific community with key “stakeholders” in each country, including policy makers, academics, business people, non-governmental organizations, and any other concerned groups. They will promote the exchange of information concerning the vulnerabilities, priorities, and capabilities of the participants.

A general workshop of all the stakeholders may not be sufficient or effective in getting their attention and participation. To ensure all stakeholders of the country are addressed with the concern they deserve and to enhance or promote awareness, a series workshops designed to address the differing and specific needs of the participants may be required.

### **3. Creating Priorities, Plans, and Actions**

With the information gathered in Components A and B, the two groups SOCIETY AND SCIENCE could form a standing committee and seek recognition as the National Coordination Committee for Climate Change (NCCCC). This committee will have the specific charter of **assisting** government and civil society in building a sustainable capacity to manage climate change.

This committee NCCCC, will invite experts to join them in identifying strategies, programs, initiatives, and other tools that will benefit their specific situation and efforts. Many activities being implemented by donor organizations and industrial nations can be drawn on to assist the NCCCC.

Regional organizations, such as CCCCC and CATHALAC will be invited to participate and contribute in the national workshops. Also, these organizations can offer direction and ensure that the groups are not at cross purposes or competing for resources.

Below are just a few of the numerous efforts being implemented that could be supported by this proposal or used by this committee to fit the needs of the countries and this region.

- **International Council of Local Environmental Initiatives (ICLEI)**  
Preparing for Climate Change  
Climate Resilient Communities
- **UK Department for International Development**  
Adapting to Climate Change
- **Canadian International Development Research Center**  
Canada Climate Change Development Fund
- **European Commission**  
DIPECHO action plan for Central America
- **World Bank, GEF, IADB**  
Mainstream Climate Risk (CARICOM-MACC)  
Invest to reduce vulnerability  
Make IDB investments Climate-Proof  
Support to WB's ADAPT- software based tool for developing projects
- **UNDP**  
Several Projects in a wide variety of disciplines  
Example: Strategy in Agriculture  
Short and Mid Term Adaptation  
Long Term Adaptation  
Sustainability of Adaptation
- **SPAIN** Ibero-American Network of Climate Change Offices, RIOCC
- **Combined Group of Several Agencies**  
Vulnerability and Adaptation Resource Group "VARG"

### **Specific Results of This Proposal**

Assistance in making the public aware that climate change is real and will affect their lives;

Energizing national governments and civil society for planning and responding to climate change;

Preparation and distribution of materials on climate change that provide linkages to the daily lives of the general population. (These must be written in the language and vocabulary they would easily understand and with understandable illustrations);

An elevated effort by educators on all levels to raise the awareness of their student body and to provide curriculums that include climate change;

Identification of key vulnerabilities to climate change and areas where implementing adaptation changes are most urgent. These could include:

- Water resources management
- Coastal and riverine flood protection;
- Building and infrastructure design and protection;
- Protection of designated habitats and species;

- Land use and sectoral planning;
- Lower agricultural production;
- Changes in the composition and productivity of ecological systems, particularly coral reefs and forests;
- Damage and population displacement due to rising sea levels and heavy rainfall events; and
- Higher incidence of heat stress mortality and exposure to vector-and water- borne diseases;

Agreement on methods and strategies to evaluate the public's perception of what is critical and which risks are unacceptable and require immediate attention;

Creation of Climate Risk Management programs and petition of local governments to adopt these programs; and

Identification of the weaknesses and needs of observational networks and systems within each country and in the region.

### **Budget for 25 Countries**

#### **Explanation:**

In order to successfully address the needs of each country the workshops should not include more than one country and they must be conducted in the country itself. This is considerably more expensive than conducting regional workshops but is also more effective.

The number and type of experts needed in Component 3 may vary from country to country. Hopefully, the experts representing potential donors or other organizations external to the host country will only require travel expenses and not a stipend.

Several of the countries will require experts to assist in organizing the workshops in terms of the basic preparation, publicizing the workshop, meeting with the stakeholders in the community, and convincing them to participate in the meeting. Arrangements will also need to be made for press and TV coverage of the meeting.

Experts may be needed to assist the NMHSs in writing the report of the workshops. These reports must be carefully crafted, as they may be presented to high government officials, quoted by the media, used in educational institutions, and become an important document for the general public.

<b>Component 1: Preparation of the Scientific Community (5 days)</b>	<b>US\$ x 1000</b>
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An experienced scientific expert including stipend & travel \$5000.0 per country for 25 countries	125.0
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Preparation Prior to Mission 2 working days  
5 working days on site  
Assist in writing report of mission (National Approval)

<b>Component 2: Stakeholders Workshop (3 days)</b>	<b>62.5</b>
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Representative of CCCCC or CATHALAC

(Assistance in preparation and conduct of workshop)  
Travel expenses only \$2000.00  
Miscellaneous expenditures to support workshop \$500.00

**Component 3: Creating Priorities, Plans, and Actions (5 days) 625.0**

Representatives from CCCCC or CATHALAC (5 days)

This workshop will be composed of representatives of donors, other NMHSs, regional centers, and experts from industry.

Assumes no cost of some participants and travel costs only for Donor Reps

Preparation for the workshop and writing the report

Minimum estimated cost per country is \$25K

**TOTAL COST US \$812.5**

## CREATING AND SUSTAINING A REGIONAL TECHNICAL SUPPORT CENTER A PROPOSAL

### Introduction

The quantification of climate change is a challenge for the global scientific community. Scientists need solid information about the changes in our climate as they happen in order to quantify the variances and differences. Daily high quality observations provided to our scientists and centers on a routine and reliable basis will provide needed solid information.

A global or regional observing system and network designed specifically for climatology does not exist. The scientific community depends on an eclectic mix of observations mostly taken for other purposes. However the World Meteorological Organization (WMO) and the Global Climate Observing System (GCOS) Secretariat are working to satisfy the needs of climate scientists and centers by improving the quality and reliability of the existing observatories.

This proposal supports the efforts of national observatories to provide higher quality and more reliable observations to global and regional centers as well as assisting the observatories of this region in maintaining the integrity of the networks.

### Proposal

This proposal seeks funding to create and maintain a Technical Support Center for the Caribbean, Central America, and Mexico for a four year period. The cost is projected to be US \$180,000 annually or US \$720,000 over the four year period.

The Technical Support Center (TSC) will be institutionalized and administered in the region as part of the WMO/GCOS, CCCCC, CRRH and other major organizations.

### Benefits of an Improved and Sustainable Observing Network

The improved network supports:

- Improvements in global and regional modeling;
- Better products and information from centers;
- Improved forecasts for the public and industry;
- Support to the identification, growth, and movement of tropical storms;
- Improves the likelihood of new initiatives and projects being successful.

A regionally sustainable network provides:

- Long-term support to donor and other initiatives and projects;
- Additional national resolve in maintaining the integrity of the network.

### Beneficiaries of This Proposal

Implementation of this proposal will benefit all initiatives and projects executed by donor organizations and any other organizations that require scientific investigation of the state of the atmosphere and its forcing. Specifically, organizations and projects that will benefit from this proposal include at least the following:

**European Commission** 5<sup>th</sup> DIPECHO Action Plan for Central America. The long-term outlooks for the number and intensity of tropical storms, droughts and periods of intense rainfall;

**Inter-American Development Bank.** The project will benefit IADB's projects and initiatives within their Priority Lines of Action regarding Adaptation to Climate Change, including:

- Mainstreaming climate risk in country programming;
- Investing to reduce the vulnerability of urban and regional infrastructure;
- Making IDB investments climate-proof

**World Bank.** Reducing carbon and still meeting the energy demands of developing countries is a main concern of the World Bank. This proposal will provide the high quality data needed by Climate Centers to understand weather patterns and to better quantify climate change, which is of utmost importance to planners.

**CARICOM.** The "Mainstreaming Adaptation to Climate" (MACC) Project is seeking to build capacity in a cost-effective way. The strategy and methods of the TSC supports capacity building and sustainable development

### **Purpose and Functions**

The primary purpose of the Technical Support Center (TSC) is to provide a high level of specialized technical expertise to the region. The observatories in this area of concern do not permanently employ or have reliable access to the needed specialized expertise. They need this expertise to support the sophisticated complex equipment and systems being used in their growing responsibilities as global partners in the world of climate and climate change. It is more cost effective to sub-contract this support than to hire permanent personnel to perform these services in house, particularly where the activity is not full time or where suitably qualified personnel are simply not available.

However, nearly all the high-level expertise needed is available in the developing countries of this region but not at any single NMHS. In general, the TCS works with a particular NMHS to use their experts to support other NMHSs. This strategy has been used successfully in our area of concern and in South America during the past several years. This strategy is the highest form of "technical cooperation among developing countries" (TCDC). However, there will be some situations where the needed technical support will need to come from manufacturers or other resources outside the immediate region.

The TSC will become a regional coordination center which shares technical information among observatories. This technical information can include new and innovative maintenance and repair methods for equipment and systems common to all the sites. A TSC/WEB site for technical publications, manufacturer's information, and discussions among the technicians to share experiences and fixes will be created. In addition the TSC will be a repository of information about the histories and capabilities of the participating countries which can be valuable to donor organizations and others that are considering new projects and initiatives for the region. The TSC could be consulted by donors when they are selecting equipment and systems for a particular country.

The TSC will maintain a small inventory of spares and parts needed by the observatories. The specific types and numbers of spares will be determined by the TSC based on their experience in failure rates. The cost of the inventory will be kept below \$5.0K.

The TSC will be an important tool in identifying the technical weaknesses and training needs of the region. The TSC would arrange and, in some cases, conduct training classes at the observatories or arrange training sessions at some central location.

The TSC will perform near real time and non-real time monitoring of the observation reports being transmitted by the observatories. TSC will provide periodic reports and summaries of the performance of the observatories to designated authorities and centers.

### **Sustainable Development**

Donor organizations, industrial nations, and others involved in providing support to developing countries are realizing that sustainable development demands meaningful participation of the recipient nation(s). TCDC is a classical method of promoting meaningful participation of the recipient nation(s). TCDC provides a modality through which developing countries can exchange and build upon their experiences.

In this proposal, sustainability is being considered as meaning the sustainable operational integrity of the observing systems and network. Major factors in achieving sustainability are self reliance and reducing dependence on donor nations. The thrust of the TSC is to build expertise and self reliance in the region.

### **General Description of the TSC**

The TSC can be considered a virtual center in that it does not require a permanent residence or special office spaces or a large permanent staff. The staff of the TCS is composed of a management capability that uses a temporary staff. The staff or technicians are from the participating countries in the region.

The technicians will be fluent in the language of the country they are visiting. The technicians will have many years of experience in working with the equipment and systems currently in place. In most cases the technicians will be familiar with the staff, equipment and capabilities of the observatories they will visit.

The TSC office can be located anywhere that has adequate telephone and internet access. The TSC does not need an elaborate workshop or a large warehouse to perform the tasks described in this document. Possible venues for the TSC are:

- The WMO Sub Regional Office for the Americas, San Jose, Costa Rica;
- The Caribbean Institute for Meteorology and Hydrology, Barbados; or
- The Comite Regional de Recursos Hidraulicos, San Jose, Costa Rica.

### **TSC Requirements**

- Experienced, qualified, and dedicated management and leadership;
- The confidence, support, and cooperation of all countries in the region;
- Must not be encumbered with national or international bureaucracy;
- Must be able to communicate freely with all members and move about the region without formal requests and approvals; and
- The support of the WMO or other UN organizations to streamline the shipment of equipment to national UNDP facilities.

## **Constraints**

The NMHSs in the region have received instruments and other equipment from different donor organizations and other nations during the past several years. The different donors provide equipment that is particular to their organizations. Therefore, the instruments, equipment and systems in a particular NHMS can be totally different than those in another neighboring NMHS. This situation defeats the advantage of having a commonality of equipment within the region. Replacement parts, spares, and warehousing in general is more difficult and more expensive. In some cases, this means the training needs of an NMHS are different from those of a neighboring NMHS given different equipment and systems.

The TSC experts may be constrained from performing some maintenance and repairs because of existing warranties or some limited maintenance contract associated with the equipment of concern.

The TSC will not have any authority to free equipment that is being held by customs or by UNDP. TSC will not pay any import tariffs or taxes or recurring observatory costs of any type, such as staff salaries, personnel transportation, electricity, fuel, or any other support to the local infrastructure.

## **Scope**

### **The GCOS observatories included in this proposal:**

**GCOS UPPER AIR NETWORK (GUAN) (6 sites)**  
Juan Santamaria Airport, San Jose, Costa Rica  
Phillip Goldston Airport, Belize City, Belize  
Grantley Adams Airport, Barbados  
Hato Airport, Curacao, Netherland Antilles  
Norman Manley Airport, Kingston, Jamaica  
Manzanillo, Colima, Mexico

**GCOS SURFACE NETWORK (GSN) (17 sites)**  
Nassau Airport, Bahamas  
Grantley Adams Airport, Barbados  
Owen Roberts Airport, Grand Cayman  
San Andres Island, Colombia  
Puerto Limon, Costa Rica  
Montego Bay, Jamaica  
Acajutla, El Salvador  
Choix, Sin, Mexico  
Monterrey, NL, Mexico  
LaPax, BCS, Mexico  
Colonia Juan Carras Mazatlan, Mexico  
Guanajuato, GTO, Mexico  
Merida, AP, Mexico  
Manzanillo, Col, Mexico  
Mexico City, DF, Mexico  
Salina Crua, OAX, Mexico  
Chihuahua, Mexico

**Budget for 12 Month Period (US\$ X 1000)**

**Upper air Observatories (GUAN) 6 sites**

Inspection and Maintenance Missions to 6 Observatories	\$25.0
3 Emergency Repair Missions	15.0
Tools, Test Equipment, Manuals for Traveling Techs	10.0

**Surface Observatories (GSN) 17 sites**

Inspection and Maintenance Missions Specified Sites	40.0
Tools and Test/Calibration Equipment	5.0

**General Spares, material for GUAN/GSN** 10.0

**Monitoring and Reporting** 15.0

**TSC Management** 50.0

**Contingency** 10.0

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**Total** **\$180.0**

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## IMPROVING ACCESS TO CLIMATE DATA IN THE REGION

### PROJECT BRIEF

#### Introduction

All climate change related projects and initiatives require open and easy access to climate data and the historical records of hydrological, oceanographic, terrestrial, and atmospheric observations. Centers or repositories for climate data and records for all the countries in the CAC region are inadequate for the growing demands of climate change and adaptation to climate change.

The Caribbean Institute of Meteorology and Hydrology (CIMH) is the center or repository for 12 of the Caribbean Meteorological Organization (CMO) member countries. A center for climate data is being considered for the 7 countries of Central America. Several observatories in the region **will not** be included in either of these two centers.

Substantial improvement for access to climate data and historical records in this region must consider at least the three following areas of concern.

- 1) The non-availability of important historical climate data;
- 2) Inadequate sharing and networking of existing information; and
- 3) Substantial gaps in many areas of climate information (hydrological, oceanographic, atmospheric, and terrestrial).

A reliable and comprehensive climate data base is essential if the CAC region is to better understand the ongoing processes of climate change; to provide the basis for monitoring and predicting climate variability; and to permit an evaluation of the impacts of climate change, including global climate phenomena such as the El Niño/Southern Oscillation (ENSO) phenomenon. Improving climate data access in the region will also contribute to the strengthening of climate observations globally and, consequently, contribute to the understanding of climate and climate change as envisaged in Article 5 of the UNFCCC.

Within the region, improvements in the availability of climate-related data will support efforts to achieve sustainable development by enabling improved planning in such sectors as tourism, agriculture, disaster preparedness, and health. This will also facilitate the development of regional climate models in order to better assess the likely impacts of climate change on the CAC region.

**Objectives:** The objectives of this project are:

1. Restoration and digitization of priority historical data;
2. Development and maintenance of electronic networks for sharing of climate data among meteorological and climate change communities;
3. Technology transfer and training to improve data collection for hydrological, oceanographic, atmospheric, and terrestrial information; and

4. Contribution to sustainable development initiatives by increasing information available for assessing climate change and climate variability.

**Project description:** The project will consist of three principal, interrelated, modular components, each with a number of activities and tasks. These comprise:

**Data Recovery and Digitization**

- Assessments of data availability
- Physical retrieval of data
- Digitization of data
- Archiving of data in accessible formats and networks

**Strengthening Information Exchange and Networking**

- Assessment of information exchange needs and availability
- Purchase of hardware and software
- Training and development of network exchange protocols
- Designation and establishment of a regional information coordinating center

**Collection of Priority Atmospheric, Hydrological, Oceanographic, and Terrestrial Data**

- Assessment of critical data gaps in hydrological, atmospheric, oceanographic, and terrestrial information
- Consultations for development of a CAC regional plan
- Identification of regional implementing agency(ies) for execution of national and regional components
- Data collection and archiving
- Data networking and accessibility

**Location:** The project will be implemented throughout the CAC region including all countries that are members of the WMO and parties to the UNFCCC.

**Duration:** Three years

**Expected Outcomes:** The project will result in:

- An improved database of climate-related information throughout the CAC;
- Enhanced networking and data availability between the climate change and meteorological communities;
- Strengthened capacity for development planning applications (e.g., agriculture, tourism, health, fisheries, water supply, disaster mitigation, etc.).

**Implementation:** The project will be jointly administered and implemented by the WMO regional office in Costa Rica (Central American component) and the Caribbean Institute for Meteorology and Hydrology (Caribbean component). A steering committee involving up to seven representatives from national and regional meteorological and climate change agencies in the CAC region will guide the implementation of project activities. Separate project coordinators will be appointed to implement the three components with regional and international short-term consultants contracted to perform specific tasks under the direction of the project coordinators.

An overall aim of project management should be to ensure harmonization of data management approaches among the project elements so as to facilitate comparability and compatibility of data and data exchange.

**Risks and sustainability:** Some historical data may be too badly deteriorated to allow significant retrieval and rescue. Insufficient political will may be present to ensure meaningful networking and exchange of data. In addition, there is a lack of a suitable institutional base for implementing CAC cooperation in this field. Moreover, national budgets and resource constraints may inhibit effective collection of data to fill critical information gaps.

**Indicative budget\*:** Data rescue: US\$200,000  
Networking and information exchange: US\$150,000  
Data collection and archiving: US\$600,000

**Total: US\$950,000**

(\*Figures include an estimated 10 percent dedicated to administrative overhead)

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## AN IOCARIBE-GOOS – GCOS PARTNERSHIP TO SUPPORT A MULTI-USE SEA LEVEL OBSERVATION NETWORK FOR THE CARIBBEAN REGION

### A PROPOSAL

#### Executive Summary

There is a growing need for high quality, real-time sea level measurements to meet various Caribbean regional marine data needs as described by, among others, the proposed Tsunami and Coastal Hazards Warning System, GLOSS, IOCARIBE-GOOS and the Global Coastal GOOS Network, and Caribbean Community Climate Change Centre, as well as national needs. The existing array of sea level measurement assets in the region does not meet those needs, nor is there any regional mechanism in place to promote development and sustainability of the array through training, education, and capacity building, or to integrate and utilize the measurements.

A partnership – an *IOCARIBE-GOOS Sea Level Observation Coordination Network* - is proposed that will:

- Leverage national and programmatic resources regionwide;
- Enhance sustainability;
- Encourage multi-purpose installations;
- Support common standards, information exchange, and applications;
- Work by strengthening existing programmes

This proposal explains the need for the system and the partnership; suggests how such a partnership might operate; and seeks funding on behalf of the partnership to provide organizational services and start-up support for the system.

#### Background

There is a growing need for high quality, real-time sea level measurements to meet various Caribbean regional marine data needs as described by, among others, the proposed Tsunami and Coastal Hazards Warning System (ICG-CARIBE-EWS), GLOSS, IOCARIBE-GOOS and the Global Coastal GOOS Network, and Caribbean Community Climate Change Centre, as well as national needs.

The existing array of sea level measurement assets in the region does not meet those needs, nor is there any regional mechanism in place to promote development and sustainability of the array through training, education, and capacity building, or to integrate and utilize the measurements.

Organized by IOCARIBE-GOOS and the Sea Level Observations Working Group of the Intergovernmental Coordination Group for the Caribbean EWS, a group of interested parties (including CCCC and GLOSS) met in San Juan, Puerto Rico on Nov 27-28, 2006 and recommended formation of a mechanism that will engage the sea level network operators and monitor the state of health of the sea level network in the Caribbean. This proposal meets those needs while promoting the design, implementation, utility, and sustainability of an integrated, multi-use sea level network in the Caribbean region

IOCARIBE-GOOS, the Regional Alliance of the Global Ocean Observing System for the Caribbean and Adjacent Regions, on behalf of the aforementioned programmes and organizations and other interested parties, supports the formation of such a network, the

IOCARIBE-GOOS Sea Level Observation Coordination Network for the Caribbean Region, as an IOCARIBE-GOOS sponsored programme.

The development of a multi-use sea level network has been an initial priority for building IOCARIBE-GOOS, with recommendations to that effect from recent IOCARIBE Sessions VIII and IX. Sea level platforms can also collect and disseminate wind, temperature, solar radiation, and other in-situ environmental parameters, and provide the building blocks for national and regional networks for the programmatic, standards-based, region wide collection, integration, and dissemination of associated ocean-earth observations. Such observation networks address the common GOOS, GCOS, GLOSS, and GEO coastal and ocean themes and support common societal goals, viz. improve predictions of weather and climate variability and change; improve the safety and efficiency of marine operations; mitigate the effects of natural hazards more effectively; reduce public health risks; protect and restore healthy ecosystems more effectively; and sustain and restore living marine resources; improve management of energy resources.

### **Terms of Reference**

The *IOCARIBE-GOOS Sea Level Observation Coordination Network* will support and leverage the efforts of existing regional sea level observations interests - IOC and other regionwide programmes, GEO countries, and other 'stabilizing' interests, alongside national interests, without developing dependency. It will require continuing involvement by participants and build the ability to support regional resources that benefit all. There is also an advantage in that a number of participants have already been identified and have expressed support, making the structure able to be implemented immediately.

*Objectives of IOCARIBE-GOOS Sea Level Observation Coordination Network* will include:

- Establishment and maintenance of an operational network of accurate, multi-purpose, real-time reporting, strategically positioned sea level measurement systems in the region.
- Assistance with and promotion of all aspects of network development and maintenance, including technical support, training, data integration, data archival, and delivery of data and value-added products to regional and global users.

*The IOCARIBE-GOOS Sea Level Observation Coordination Network*, will:

- Be composed of representatives from groups with an interest in maintaining regional sea level measurement systems and utilizing the information collected.
- Be supported, both directly and through the activities of participants, by national agencies, international programmes, and donor states and organizations that recognize the societal, scientific, and economic importance of maintaining a regional sea level network for its contributions to coastal management, tsunami and coastal hazard response, and assessing and adapting to climate change.
- Be based on principles of free and open data exchange, and adopt international standards of data collection, quality, and reporting (e.g., as described by GLOSS, GEOSS, IODE, the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology, and similar bodies).

### *Scope of Functions and Activities*

In addition to supporting their own sea level observation activities, network participants should strive to support the following activities for the benefit of the network:

- Maintaining an accessible data base of resources relevant to the Sea Level Network, including:
  - A complete list of regional installations and associated metadata
  - A directory of relevant experts available for consultation, and their areas of

- expertise
- Setting standards and making recommendations for
  - Installation methods, benchmarking, and long-term referencing
  - Data communication methods
  - Levels of equipment accuracy and performance
  - Data reporting and archiving
- Providing resources (software, web services, etc.) for the dissemination of
  - Integrated regional sea level data and products
  - Local sea level data, analyses and products
- Promoting the interests of participants in relation to
  - Training and capacity building in sea level observation, analyses, and products
  - Regional and global intergovernmental programmes with interest in sustained sea level observations
  - Funding agencies interested in supporting sustained sea level observations

### *Membership*

Entities active in the IOCARIBE-GOOS Sea Level Observation Coordination Network – “members “ - will be groups with an interest in maintaining regional sea level measurement systems and utilizing the information collected. This includes, but is not limited to, national agencies, research and academic institutions, intergovernmental and regional organizations, non-governmental organizations, and commercial enterprises.

### *Benefits of membership*

- Members will have access to resources (training, support, expert advice, products, data, etc.) made available by other members;
- Members will be able to act on behalf of the network to raise funds to support their own programmes as contributions to the network ;

### *Obligations and responsibilities of membership*

- Members will support the collection of accurate, sustained, water level observations within their jurisdiction;
- Members will endeavour to provide water level data and related products within their jurisdiction to the public in real or near-real time;
- Members will endeavour to abide by the standards and recommendations of the network for water level measurement and reporting;
- Exclusive of specific agreements between members, their agencies, or nations, data, products, and support provided to the consortium will be available to all members.

### *Governance*

As a subsidiary body of IOCARIBE-GOOS, the network will be governed by rules defined by the IOC and I-GOOS. The exact structure is yet to be determined,

## **Proposal for IOCARIBE-GOOS Sea Level Observation Coordination Network Organization and Support**

If funded, IOCARIBE will initially sponsor the organization through IOCARIBE-GOOS. IOCARIBE-GOOS Sea Level Observation Coordination Network will undertake the following tasks.

- Provide organizational leadership through provision of a Network Coordinator, serving the membership;
- Solicitation for initial network membership
- Drafting of complete Terms of Reference and Charter for approval of membership;

- Initial organization and fundraising on behalf of the network and members
- Development of data management and internet resources in support of the network and members
- Sponsorship and coordination of training and consulting networks
- Funding of network activities and member contributions, including development, maintenance, and expansion of national and regional networks, and development of applications. This would be undertaken by developing and promoting member's proposals to outside sources, and by soliciting funding to support IOCARIBE-GOOS and the network on behalf of participants.

### *Proposed Activities*

#### I. Support for Planning, Initial Formation, and Governance (direct support for a Network Coordinator)

As a first step towards implementation of the network, we propose the appointment of an Observing Network Coordinator. The Coordinator should support the development of the network (as directed by IOCARIBE-GOOS and network members); regional participation in the network; enhancement of members' capabilities to contribute to the system; the utilization of the system to create products and decision support tools; and integration of the system into emergency management and mitigation processes.

Coordinator shall be based within the region (IOCARIBE can negotiate location and office space if necessary)

Coordinator will work with network members to develop and maintain an accessible data base of resources relevant to the Sea Level Network, including:

- Sea Level contacts and responsible parties in each country in the region;
- Regional organizations operating sea level stations or networks;
- A complete list of existing regional installations and associated metadata;
- A directory of regional experts available for consultation, and their areas of expertise.

In consultation with relevant IOC Operational Programmes and Committees (GLOSS, Tsunami, GOOS, GCOS, JCOMM, IODE) and other members, Coordinator will identify and disseminate standards and make recommendations for:

- Installation methods, benchmarking, and long-term referencing;
- Data communication methods;
- Levels of equipment accuracy and performance;
- Data reporting and archiving;

Provide resources (through dissemination of software, procurement of web services, etc.) for the dissemination of

- Real time network operational status
- Integrated sea level data and products
- Local sea level data, analyses and products

to the public and appropriate agencies and authorities.

Coordinator will promote the interests of the members in relation to

- Training and capacity building in sea level observation, analyses, and products
- Regional and global intergovernmental programmes with interest in sustained sea level observations
- Raising funds through regional / World Bank, UN organizations, GEO nations, national governments, etc.

IOCARIBE-GOOS, the Coordinator may hire technical experts or contractors for support in these activities if needed and funds are available

Related Budget Items:

Direct start-up funding to IOCARIBE-GOOS for management support (1.5 or 2 salary for IPAs or contractors, admin support, travel)	200K/yr
Support for initial meeting of membership	25K year 1

II. Prospective Members may solicit for funds here

For instance:

GLOSS: Install and support GLOSS reference stations in the Caribbean Region
ICG-CARIBE-EWS: Install Multi-purpose Sea Level gauges in top priority tsunami warning sites;
CCCCC: Purchase spare parts/multi-purpose upgrades for CCCCC gauges
Individual IOCARIBE COUNTRIES for national networks
ODINCARSA: Provide data management and distribution services for network

III. Direct support provided to members to assist with services to the network:

Services would be expected to include: formation of Technical Advisory Group(s), Workshops, Data Management and distribution services, Product development, multi-hazards applications and expansions	\$100K/year starting year 2
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IV. Direct support to members for capital projects (installations, upgrades) to fill system gaps

Direct support to members (through proposals to IOCARIBE-GOOS, requires matching funds) for capital projects (installations, upgrades) to fill system gaps	\$125K/year starting year 2
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Discretionary money to give out via proposals (III and IV, with external review) also induces membership. Alternatively (and additionally), support could be given directly by donor nations with provision that countries must be consortium member. All proposals would be subject to outside review.

Totals

Year 1 IOCARIBE for Network \$225K + Member support as available

Year 2 IOCARIBE for Network \$425K+ Member support as available

Year 3 IOCARIBE for Network \$425K+ Member support as available

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**DRAFT TERMS OF REFERENCE FOR A GLOBAL CLIMATE OBSERVING SYSTEM (GCOS) REGIONAL COORDINATOR FOR CENTRAL AMERICA AND THE CARIBBEAN**

The GCOS Regional Coordinator will provide an overall focus for planning, implementation, and information on GCOS in the region by:

- a) Establishing contact and maintaining liaison with GCOS national coordinators and focal points in member countries;
- b) Maintaining an ongoing review of the status of GCOS implementation and the GCOS Regional Action Plan for the region;
- c) Advising and assisting those responsible for the main component systems (World Weather Watch Global Observing System, Global Ocean Observing System, etc.) in the region and on their contribution to GCOS;
- d) Serving as initial contact and coordination point for potential funders and implementation agents for GCOS projects in the region
- e) Providing regular advice and progress reports to the regional counterparts of the GCOS sponsors (WMO Regional Association IV, IOCARIBE, etc.) on the overall state of GCOS implementation in the region;
- f) Serving as a channel of communication to the GCOS Secretariat on regional aspects of GCOS implementation;
- g) Ongoing liaison with the Global Earth Observation System of Systems (GEOSS) Regional Coordinator on GCOS-GEOSS harmonization in the region; and
- h) Supporting and advising members in international for a dealing with GCOS matters.

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## P R E S S   R E L E A S E

### **BELIZE HOSTS CLIMATE OBSERVATION MEETING**

The Secretariat of the Global Climate Observation System (GCOS) and the Caribbean Community Climate Change Centre (CCCCC) are organizing a meeting at the Belize Biltmore Plaza Hotel in Belize City from January 28 to 30, 2007 to further the implementation of the GCOS Regional Action Plan for Central America and the Caribbean.

Regional and international funding agencies will meet with regional agencies involved in the deployment and maintenance of observation systems used for monitoring climate and climate change. These include the World Bank, the Inter American Development Bank, the Caribbean Development Bank, the Caribbean Meteorological Organization and the Central American Commission on Environment and Development. They will discuss the status of the existing monitoring programmes, the state of implementation of the regional GCOS Action Plan, new regional priorities, and proposals to enhance existing systems or implement new programmes. The observing systems include surface weather and hydrological observing networks, marine monitoring programmes, upper air observing systems, radar networks and data processing and archiving systems.

The data generated by these networks are used by national, regional and international agencies to monitor weather and climate. The data is used operationally by weather services to prepare weather forecasts and warnings. The research community uses the data to analyse trends in climate, detect climate change, and undertake research to get a better understanding on the processes that generate weather and climate. The research communities of other applied sciences also use the data to study the impact of the climate on sectors such as agriculture, forestry, health, and ecosystems.

The Caribbean and Central America have noted a serious deterioration on the observing networks in the region and have been lobbying the climate change, hydrological, marine, and meteorological communities for action to reverse this trend. Belize has been in the forefront of the international effort to address this challenge. An international programme was established to address the problem and regional action plans developed to provide concrete projects to address region specific concerns. This meeting will further the implementation of this process.

GCOS is a programme within the World Meteorological Organization (WMO) funded by WMO, the Intergovernmental Oceanic Commission (IOC) of UNESCO, the United Nations Environmental Programme (UNEP), and the International Committee of Scientific Unions (ICSU). Its headquarters are located in Geneva, Switzerland. The CCCCC is a specialized CARICOM agency created to coordinate the region's response to climate change. Its headquarters are located in the City of Belmopan, Belize.

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For more information on the GCOS Meeting please contact the local organisers as follow:  
Mr. Carlos Fuller or Mrs. MaryAnn Sutherland at the Caribbean Community Climate Change Centre at  
Tel: + (501)822-1104/1094.

For more information on the CCCCC and it's activities please go to our website [www.caribbeanclimate.bz](http://www.caribbeanclimate.bz) where you can also register to receive automatic updates.