

Progress Report 8

July - December, 2000

Caribbean: Planning for Adaptation to Global Climate Change

A Joint Project of OAS-CARICOM-UWICED-World Bank-GEF

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Acronyms

CARICOM Secretariat	Caribbean Community Secretariat
CARICOMP	Caribbean Community Productivity
CCCC	Caribbean Climate Change Centre
CCCDF	Canadian Climate Change Development Fund
CCDC	Caribbean Coastal Data Centre
CDB	Caribbean Development Bank
CDERA	Caribbean Disaster and Emergency Response Agency
CDM	Clean Development Mechanism
CEIS	Caribbean Energy Information System
CERMES	Centre for Resources Management and Environmental Studies
CGLIS	Certificate in Geographic and Land Information Systems
CIDA	Canadian International Development Agency
CIMH	Caribbean Institute of Hydrology and Meteorology
CMS	Centre for Marine Sciences
COP6	Six Conference of the Parties to the UNFCCC
CORS	Continuously Operating Reference Stations
COTED	Council for Trade and Economic Development
CPACC	Caribbean: Planning for Adaptation to Global Climate Change
CREDP	Caribbean Renewable Energy Development Project
CRIS	Coastal Resources Inventory Systems
CTO	Caribbean Tourism Organization
CXC	Caribbean Examinations Council
CZMA/I	Coastal Zone Management Authority and Institute
DFID	Department for International Development (UK)
EPA	Environmental Protection Agency
EWI	Environmental Association of West Indies
GCSI	Global Change Strategies International Inc.
GEF	Global Environment Facility
GIS	Geographic Information Systems
GS/OAS	General Secretariat of the Organization of American States
ICRI	International Coral Reef Initiative
IMA	Institute of Marine Affairs
IMPACC	Implementing Adaptation to Climate Variability and Change in the Caribbean
ISC	Information Systems Coordinator
MOU	Memorandum of Understanding
NFPs	National Focal Points
NICUs	National Implementation Coordinating Units
NOAA	National Oceanographic and Atmospheric Administration (US)
OAS	Organization of American States
OECS/NRMU	Org. of Eastern Caribbean States/Natural Resources Mgmt. Unit
PAC	Project Advisory Committee
PDF	Project Development Facility
QA/QC	Quality Assurance/Quality Control
RAC	Regional Archiving Centre
RNC	Regional Network Coordinator
RPIU	Regional Project Implementing Unit
SIDSnet	Small Islands Developing States network (UNDP project)
SST	Sea Surface Temperature
TSCRO	Technical Support and Communications Research Officer
TSTT	Telecommunications Services of Trinidad and Tobago Ltd.
UKCIP	United Kingdom Climate Impacts Program
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework for the Convention on Climate Change
UNSD	United Nations Statistics Division
USDE	Unit of Sustainable Development and Environment
UWI	University of the West Indies
UWICED	University of the West Indies Centre for Environment and Development

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Executive Summary

Project Implementation

The project has continued its full implementation. Major advances have been accomplished both in the technical aspects as well as in the future sustainability of the project. The Caribbean: Planning for Adaptation to Global Climate Change (CPACC) has continued to gain recognition in the region as the source for technical information on climate change.

Initial agreements have been reached between the Caribbean Community (CARICOM) Secretariat, the World Bank, the Organization of American States (OAS), and the Regional Project Implementing Unit (RPIU) on the concept and proposal for the continuation of CPACC in the form of Implementing Adaptation to Climate Variability and Change in the Caribbean (IMPACC).

The World Bank/OAS/RPIU team have developed a concept "Mainstreaming Climate Change in Development," which outlines a strategic operational framework for addressing climate change issues in the Caribbean in the long-term. The main themes include:

- Extending the use of climate data to a broad range of sectoral application;
- Downscaling of global climate models in support of decision making on adaptation at the country and regional level;
- Supporting the countries in using Carbon Trading to promote their sustainable development agendas; and
- Systematic integration of climate change considerations into the development planning and investment processes in the public and private sectors.

Primary financing will be sought from the Global Environment Facility (GEF). Co-financing for this new activity is being explored through a number of avenues including the Canadian Climate Change Development Fund (CCCDF), the private sector and a number of bilateral donors. Efforts are also ongoing to assess the potential opportunities through private foundations.

A Project Development Facility, PDF, (Block B) proposal will be submitted to the GEF Secretariat to prepare the full proposal for the future project. At their regular meeting in July 2000, CARICOM heads of Government decided that the Caribbean Climate Change Centre (CCCC) should be established as soon as possible to effect a smooth transition from CPACC to IMPACC. A draft Legal Agreement for the Centre has been developed and is being reviewed.

Next six months

January – June 2001 will bring a very active period in CPACC not only regarding the specific aspects of its implementation but also on its sustainability. Several pilot components will have the first set of draft outputs. A PDF-Block B for GEF will be submitted for funding in March 2001 for implementation during the second semester of 2001.

This report was prepared by Leisa Perch, CPACC Technical Coordinator (GS/OAS) and CPACC/RPIU staff members Ulric Trotz, Leslie Walling, Ian King, Rawlestone Moore, and Judi Clarke.

Financial Status

The table below shows a snapshot of expenditures cleared by the OAS Financial Services as of December 2000 (this includes expenditures at UWI). In addition, the last two columns on the right show the new disbursement profile for the last year of the project (January – December 2001) and the total project expenditure.

Expenditures According to Project Components

Component	Cumulative since project effectiveness (April 97 – Dec 2000)	Expenditures as a% of total budget	Planned 2001 (January – December 2001)	Project Total
1. Design /Establishment of Sea Level/Climate Monitoring Network	\$728,089	89.7	\$83,410	\$811,500
2. Establish Database and Information System	\$253,027	64.8	\$136,897	\$389,925
3. Inventory of Coastal Resources and Use	\$321,384	44.9	\$394,315	\$715,700
4. Formulation of a National Climate Change Adaptation Policy	\$119,824	39.4	\$184,025	\$303,850
5. Coral Reef Monitoring	\$188,777	47.9	\$204,847	\$393,625
6. Coastal Vulnerability and Risk Assessment	\$204,186	48.8	\$214,113	\$418,300
7. Economic Valuation of Coastal and Marine Resources	\$119,934	38.8	\$189,065	\$309,000
8. Economic and Regulatory Proposals	\$53,290	27.7	\$138,709	\$192,000
9. Greenhouse gases inventory/agri-water resources assessment	\$98,782	81.6	\$22,217	\$121,000
RPIU	\$1,561,701	75.4	\$507,798	\$242,980
Executing Agency	\$563,990	82.6	\$118,129	\$682,000
Contingencies	\$176,313	72.5	\$59,229	\$2,070,000
Total Project	\$4,389,302	66	\$2,260,197	\$6,649,880

Commitments and Replenishments

Withdrawals from CPACC account	Expenditures incurred during	
Initial advance:	Advance	\$500,000
Withdrawals 2 through 6	CY1: April 97- Dec. 97	\$781,182
Withdrawals 7 through 12	CY2: Jan – Dec. 98	\$869,003
Withdrawals 13 through 18	CY3: Jan. – Dec. 99	\$1,028,026
Second Advance	Dec. 99	\$300,000
Withdrawals 19 through 25	CY4: Jan. – July 00	\$1,034,526
Withdrawals 26 - 29	CY4: Aug– Dec 00	\$485, 293
Total from CPACC Special Account at World Bank	April 97 – June 2000	\$4,997,293

A total of \$662,853 in Expenditures was reported during the period July – December 2000.

CPACC Administration

Executing Agency: Organization of American States

The General secretariat of the Organization of American States (GS/OAS) continued to provide technical, management and financial oversight of project implementation. During the period under review, the GS/OAS has been involved in several activities, including:

(a) World Bank supervision mission

The GS/OAS and RPIU coordinated the fifth World Bank supervision mission. The main objectives of the World Bank mission were to review progress to date on project implementation, review financial management arrangements, and discuss follow-up activities, particularly IMPACC and the methodology for establishing the CCCC. The Bank commended the OAS and the RPIU staff for their dedication to the project. Project overall implementation performance was rated satisfactory. The Bank noted that all project components are progressing steadily with some outputs anticipated by June 2001. These delays have caused a bunching of project implementation activities towards the end of the project, which may create some problems. For the remainder of the project, there will be a need to increase the pace of execution and consequently the rate of disbursements. All major participants in project implementation, namely GS/OAS and RPIU, will be required to optimise staff time by setting distinct priorities and deploying the maximum manpower to the field in support of the implementation of the different components.

(b) Revision on the Financial Reporting

The OAS initiated discussions and review of financial reporting procedures and flows with the RPIU based on the following:

- Speeding up monthly replenishment and at a sustainable level to execute the project in the remaining time-frame;
- Developing procedures and mechanisms for adequate and accurate accounting of expenditures and logging them so that financial record at the OAS and RPIU are up-to-date;
- Developing procedures for requests for expenditures and reporting;
- Clarifying procedures for the claiming of expenditures; and
- Maintaining effective project management at the Component level.

(c) Change over from Mr. Claudio Volonté to Ms. Leisa Perch as Technical Coordinator

During the reporting period Ms. Leisa Perch was seconded to carry out the duties as Technical Coordinator formerly the remit of Mr. Claudio Volonté.

(d) Sixth Conference of the Parties (COP6) to the United Nations Framework Convention on Climate Change (UNFCCC)

The OAS participated in COP6 at the Hague (November 13-24 2000) as part of the CPACC team. A CPACC booth was organized for the meeting, including PowerPoint presentations of Component 1 and 5. The OAS also collaborated with the Government of St. Vincent and the Grenadines to finalize the National Communication to the UNFCCC in preparation for the COP and presented the Initial National Communication to the UNFCCC Secretariat at the Hague.

(e) Support to RPIU staff

The Centre for Training and Development of the OAS continued to provide assistance to the RPIU staff pertaining to office morale, staff perceptions of their job, conflict resolution, problem solving, team motivation and organization of work. A series of recommendations are being gradually implemented.

Regional Project Implementation Unit (RPIU)

Office Space

All of the space allocated in the RPIU is fully occupied. Officers have had to share office space and this situation will be further exacerbated with the hiring of an assistant for the Accounts Technician. Visiting consultants have had to share office space with Technical officers or use space in the outer office.

RPIU Staffing

During the reporting period Ms. Leisa Perch was seconded to the OAS office in Washington to carry out the duties as Technical Coordinator formerly the remit of Mr. Claudio Volonté. Ms. Judi Clarke was assigned responsibility for public awareness and education, liaising with Ms. Perch on Components 7 and 8 implementation and giving logistical support for C4 implementation. In addition Ms. Clarke provides logistical support to the Project Manager.

Mr. Moore continues to be responsible for C6 implementation and supporting C4 activities. The outputs from C6 will provide an excellent basis for developing the National Policy in C4 in the three C6 pilot countries. He is also responsible for assisting with the coordinating of the United Nations Development Program (UNDP) Enabling Activities Project through the University of West Indies Centre for Environment and Development (UWICED).

For C5 the services of a data management officer Ms. Marcia Creary were engaged. She is operating out of the Centre for Marine Sciences (CMS) in Jamaica. Ms. Shelly-Ann Jules-Moore has been employed as manager of the Regional Archiving Centre (RAC), which is now housed in the Centre for Geospatial Studies at UWI, St. Augustine.

Mr. Carlton James has been employed as a consultant to further develop the public awareness and education program for CPACC. Part time services of Ms. Jennifer Watson, an UWI Student, are being utilized to support maintenance and updating of the website and the office network. The services of an Assistant, Ms. Barbara Haynes, have been engaged to support the Financial Management and Administration of the CPACC/RPIU.

Financial procedures and reporting

The procedural manual for internal administrative and financial transactions at the RPIU has been completed and submitted to RPIU by Price Waterhouse Coopers, Barbados. Some of the recommendations have already been put into place.

Timely Financial reporting at this stage is critical for avoiding delays in the disbursement of Funds from the OAS. A number of internal procedures have been adopted to address this concern.

World Bank Supervision Mission

The World Bank conducted the fifth supervision mission on October 27-28th, 2000 in Barbados. The planned trip to Belize had to be postponed and eventually cancelled due to the impact of Hurricane Keith on Belize in earlier October 2001.

The World Bank conducted the fifth Supervision Mission in October 2000 at the RPIU in Barbados (Annex 1). The World Bank's continuing concerns were the successful completion of CPACC on time and with full disbursement. To this end the RPIU was mandated to prepare a matrix clearly showing a timetable of remaining activities, deliverables and resources required to accomplish these. These have been prepared for submission in January 2001. It was also agreed that a Financial Review meeting could be held to plan appropriately for the upcoming year of activity.

The RPIU was also requested to convene a meeting with organizations responsible for managing global observation systems (climate, ocean, coral reefs), with a view of determining how CPACC's data can be fed into the global system and what benefits can accrue to CPACC from the latter (early 2001 was suggested). Strategies for the development of IMPACC and the CCCC were also discussed.

Project Sustainability

- (a) *Canadian Climate Change Development Fund.* A project proposal has been developed for consideration by the CCCDF, which is managed by Canadian International Development Agency (CIDA). This followed a visit to CIDA by a CPACC team consisting of Walter Vergara, Jan Vermeiren and the Project Manager and Deputy Project Manager. The proposal was developed in collaboration with Canadian counterparts – Global Change Strategies International Inc. and de Romilly and de Romilly. The final proposal will be submitted to meet the deadline of February 11, 2001.
- (b) *Establishment of the Caribbean Climate Change Centre.* The First Draft of the Legal instruments for the establishment of the CCCC has been completed. This follows a decision at the supervisory mission meeting to establish the Centre before the completion of CPACC following the Heads of Government endorsement of the Centre in July 2000.
- (c) *Project Development Fund Block B Proposal for IMPACC.* Several drafts of the PDF-Block B grant proposal have been considered and this is now in the final phase of preparation for submission to the GEF. A Concept Paper was created to reach an agreement on a shared vision for IMPACC (Annex 2).
- (d) *Government of the United Kingdom.* Discussions have been initiated with the Department for International Development (DFID) to canvass support for some of the projected activities under IMPACC – regional climate change modelling, stakeholder participation in adaptation planning.

Public Awareness Strategy

- Whenever the opportunity arises the Project Manager and the Public Awareness Consultant promote greater awareness of climate change issues in general and CPACC in particular among senior regional political and private sector personalities.
- Radio clips for dissemination have been prepared by CARICOM, in collaboration with the Secretary General, Hilford Murrell, Paul Keenes Douglas and Project Manager.
- Radio interview with Dr. Leonard Nurse has been completed, edited and is ready for distribution.

- Television interview with Project Manager and Rawlestone Moore completed, edited and ready for airing at the end of February.
- E-groups for regional private sector and media set up.
- Continued interaction with media. Press conference held on COP6 negotiations.
- Glossary of terms used in Climate Change community developed for distribution to media and private sector networks.
- Strategy for networking private sector and media completed and implementation has started.
- The Project Manager addressed several fora – Caribbean Development Bank (CDB) seminar, Association of Professional Engineers Barbados, UWI Masters Class, and Public Consultation in all twelve participating countries during the C4 process.
- Initiatives taken to include some aspects of climate change science in the Caribbean Examinations Council (CXC) curricula.
- Articles written in press.
- Under C4 all countries were required to develop an appropriate public education and awareness strategy. The approach developed by Trinidad and Tobago has been disseminated to other countries on a model for best practices.
- Programs “Stitch in Time” prepared and being distributed for broadcast.

RPIU participation in international, regional and national workshops and conferences

(a) The Project Manager participated in the following:

- Forum of Ministers of Environment, Latin America and the Caribbean (LAC) in Barbados – full endorsement of CPACC and the proposal to establish the CCCC. At this meeting also, the C1 equipment was formally, handed over to the Barbados Minister of Environment, Energy and Natural Resources.
- Two National Consultations in Jamaica to:
 1. Finalize their National Communications.
 2. Finalize their National Environmental Strategy paper.

At both, CPACC proposed follow-up (IMPACC) and the CCCC were presented and discussed.

Follow-up discussions were held with the Permanent Secretary, Ministry of Water and his senior officials to explain the purpose of IMPACC and the CCCC.

- Meeting with CIDA along with Deputy Project Manager, Walter Vergara and Jan Vermeiren to make presentations on CPACC, IMPACC and the CCCC and canvass support for a regional project from the CCCDF.

- At COP6 in the Hague (November 13-24,2000) a presentation on CPACC was made during the ceremony at which the First National Communications of four Caribbean countries were presented. Also participated in a forum on the Caribbean Clean Development Mechanism (CDM) project and in the launching of the book Climate Change and Development a collaborative effort of UNDP regional bureau for LAC and the Yale School of Forestry and Environmental Studies.
 - Under C4, participated in National consultations in all CPACC countries.
 - Commonwealth Secretariat Environmental Task Force (London) – presentation on follow-up plans to CPACC and the CCCC in effort to canvass support for these initiatives.
 - United Kingdom Climate Impacts Program (UKCIP) Oxford – discussion about a collaborative program for input into C4 and possible interface with the Hadley Centre to develop capacity for regional modelling.
 - Presentation to DFID, Barbados on status of implementation of CPACC and future plans.
 - The Deputy Project Manager represented CPACC at the Heads of Government meeting in Canouan.
 - It was at this meeting that the proposal to establish the CCCC was approved.
 - The Deputy Project Manager made a presentation of C5 to the World Bank at a meeting specially arranged by Walter Vergara.
 - The Project Manager met with the CARICOM Secretary General to discuss modalities for approaching the establishment of the CCCC. Also met with the legal consultant to CARICOM to provide briefing on the draft agreement for the establishment of the Centre.
- (b) The Information Systems Coordinator (ISC) participated in the following meetings:
- Workshop on Environmental Statistics convened by the United Nations Statistics Division (UNSD) in collaboration with the CARICOM Secretariat in San Ignacio, Belize from 2 to 11 August 2000 (Information System Coordinator—ISC attended 6th to 10th August).
 - Islands of the World VI Conference, Isle of Skye, 16-20 October 2000 (whereas no representative from the CPACC RPIU was able to attend, a paper on the Caribbean SIDSnet, Small Islands Developing States network, experience was submitted).
 - LAC Experts Consultation on Chapter 3 of the GEO3 Scenarios, convened by UNEP Mexico Office and held in Santiago, Chile from 14th to 16th November 2000.
- (c) The PRPO participated in:
- A Regional Symposium on the Creation of an Integrated Information System, convened by the Environmental Association of West Indies (EWI) Guadeloupe, Guadeloupe, June 8-9th, 2000.

Project Advisory Committee

The Project Advisory Committee (PAC) held its meeting at the CARICOM Secretariat in Georgetown, Guyana July 19 – 20, 2000. The meeting was chaired by Assistant Secretary

General, Mr. Byron Blake and provided an excellent forum to discuss strategies for ensuring the sustainability of CPACC activities at the end of the project. In keeping with this objective the meeting endorsed the efforts to pursue the PDF-Block B grant, further definition of the CCCC and to seek support for a grant from the CCCDF for a regional project.

Expressions of concern were voiced about the level of disbursement at this stage of the project and of the ability of the RPIU to access remaining funds before project closure. Assurances were given that funds will be accessed and that the tardy disbursement profile was due to the large amount of preparatory work that had to be completed before activities got off the ground. The need for timely financial reporting and disbursement was also highlighted.

Caribbean Climate Change Centre

Brainstorming session

This session was arranged under the umbrella of the World Bank Supervision Mission and was designed to solicit ideas from a wide cross-section of regional personnel on seeking further support for IMPACC and to further discuss the establishment of the CCCC (part of the report of the meeting related to the CCCC is provided in Annex 3).

Collaboration with CARICOM Secretariat

The CPACC Project Manager continues to liaise closely with the CARICOM Secretariat on CPACC and project sustainability issues such as the establishment of the Centre. In particular, the following summarizes activities and progress to date:

- CPACC has begun working to establish closer ties with Caribbean Disaster and Emergency Response Agency (CDERA) and Caribbean Tourism Organization (CTO) particularly regarding strategic partnerships on climate change activities at the regional level.
- CPACC has approached the Prime Minister of Belize (Government Head elected during the Heads meeting in March with responsibility for Environment) for the purpose of advocacy on climate change matters.
- CARICOM and CPACC/RPIU are working closer together on the development of the legal agreement for the centre.

National Implementation Coordinating Units

- Mr. Elvis Requena was appointed the National Focal Point (NFP) for Belize in the fourth quarter of 2000.
- There were changes in the St. Lucia and Dominica NFPs during the period under review:
 - In St. Lucia, due to changes in Ministerial portfolios, it was changed from Ms. Anita James of the Water Resources Management Unit, Ministry of Agriculture to Mr. Crispin d'Auvergne, Sustainable Development and Environment Unit, Ministry of Finance and Planning.

- Mr. Mark John has taken over as the Head of the Environmental Coordinating Unit of the Ministry of Agriculture, Planning and Environment as well as the CPACC NFP. Mr. Gerard Hill is on study-leave for a year.
- The meeting of the NICU's took place in Mainstay, Guyana, (July 17-18). The session witnessed the full involvement of the NICU's in project implementation especially in the pilot activities and in C4 implementation. The NICU meeting was held just prior to the PAC meeting (July 19-20) and NICU issues were discussed at the latter after representation by their representative.

C4 implementation is being used as a catalyst to assist NICU's with local public awareness and education efforts. It is also anticipated that it will facilitate the development of an interface between the NICU's and the decision making elite in the respective countries as well as sensitising the political directorate to the role they are expected to play in helping the country to address climate change issues.

Capacity-building Activities

CPACC sponsored a series of training workshops during this period (for more details, see relevant component below):

Technical Workshops

- Coastal Resources Inventory Systems (CRIS) Database Design and Systems Maintenance Workshop and Feature Extraction from IKONOS Satellite Imagery Workshop, PRT (Barbados) Ltd. Training Facility, Barbados, 30th October to 4th November 2000. During this workshop, 25 participants, seven trainers and two RPIU officers from 12 countries took part.
- Workshop on Economic Decision-making tools for Climate Change Adaptation Policy, St. Kitts, August 28th – September 1st, 2000. There were 35 participants in total from across the region, including seven presenters, four consultants and two representatives from the RPIU.

Hands-on training

- Training on monitoring stations equipment calibration for Caribbean Institute of Meteorology and Hydrology (CIMH) staff.

Certificate Programs

Sponsorship in the Certificate in Geographic and Land Information Systems (CGLIS) program came to a conclusion with the temporary halt of the program after the 1999-2000. Most participants sponsored by the CPACC Project were in the process of concluding or had concluded their final projects during the period.

Other Matters

UNDP/GEF Support Program

The UNDP/GEF National Communications Support Program (NCSP) has been put in place in the region (through UWICED) to provide assistance to the Caribbean countries. Professor Al Binger, Messrs, Brian Challenger, and Rawleston Moore are involved in the implementation. The program hosted a COP6 preparatory workshop in conjunction with CPACC in October of 2000 in St. Lucia. Three countries – Jamaica, Guyana and Grenada have finalized their National Communications and handed over to the UNFCCC Secretariat during a special presentation at COP6 in the Hague.

Clean Development Mechanism (CDM) – Baselines

One of the outcomes of a regional consultation on the CDM sponsored by CPACC was the further development of a regional project, which would examine the development of regional baselines and a portfolio of regional projects eligible for CDM support. The project has been executed in collaboration with Global Change Strategies International Inc. (GCSI/Canada), Clean Air Policy Institute (USA) and the Commonwealth Science Council.

The management of this initiative has been passed on to the Caribbean Energy Information Systems (CEIS) Network, and work has continued on the compilation of data required to estimate the baseline. A presentation was made at COP6 on the preliminary results of the process. Thus far, it has been noted that significant opportunities exist in the energy and gas sectors.

CPACC Technical Activities

Component 1: Design and Establishment of Sea Level/Climate Monitoring Network

Installation of monitoring stations

Completed.

Station Configuration and Equipment Installation

All 18 monitoring stations have been installed and are functioning.

Regarding the earth ground station, an agreement has been signed with the UWI Centre for Geo-Spatial Studies (St. Augustine) for siting the facility.

Operation, Maintenance, and Calibration

The Regional Network Coordinator (RNC) function has now been handed over formally to the CIMH. The CIMH is responsible for coordinating the maintenance, repair and calibration of the network.

Operational procedures are in place for the CIMH Technician and the National technical Officers to make decisions on repair, replacement, and periodic verification of the calibration of the instruments. Instruments that are defective, or for which the calibration needs to be verified, will be shipped to CIMH to be replaced by a reconditioned one. CIMH has established pre-paid shipping arrangements to cover all costs related to this transaction. CIMH also has a Sea-Level and Climate Monitoring Replacement Fund, which will kick in to replace sensors that have exceeded their useful life.

Data Acquisition, Archiving, and Dissemination

A Regional Archiving Centre (RAC) has been established by CPACC at the Centre for Geospatial Studies at the UWI in St. Augustine, Trinidad and Tobago. The RAC will be responsible for verifying the quality of the data produced by the sensors, and with promoting the use of and developing applications for these data. The Technical Coordinator of the RAC is Ms. Shelley-Ann Jules, who previously worked with the Institute for Marine Affairs (IMA) with responsibility for the CPACC sea-level data.

Regional Archiving Centre (RAC)

GOES Satellite Downlink

The first shipment of equipment from VITEL was received by December 21, 2000. The shipment basically contained an office workstation and peripheral devices. A base Station equipment is to be received in January 2001.

Based on evaluation executed at VITEL malfunctioning stations and their possible causes were forwarded to the RNC at CIMH by December 2000.

Data Quality Assurance/Quality Control (QA/QC)

Executed checks on the current and proposed CPACC database to identify problem areas (VITEL, 5-12/12/2000).

Executed transmission checks on all the CPACC stations. Transmission problems were identified for eight stations, and sensor malfunction for a number of others. Findings communicated via e-mail to RNC, CIMH on December 12, 2000.

RAC Website

Demo RAC Website reconstructed to facilitate new database, and more efficient functionality.

Responded to Ms. Desiree Sasko, Research Associate, Perry Institute for Marine Science, Caribbean Marine Research Centre. Ms. Sasko indicated difficulty in accessing data on the website. Advice was given, but the situation is still to be resolved.

Products from Data

Datum reduction computations were executed in November 2000 for:

- Port of Spain, Trinidad (MSL and CD).
- Charlotteville, Tobago (CD).
- Guayaguayare, Trinidad (MSL).
- Castries, St Lucia (MSL).
- Discovery Bay, Jamaica (MSL).

These sites were selected based on the current data available to the RAC Coordinator (currently awaiting additional information).

Summary Sheets were created for the above stations.

GPS files were created (currently awaiting additional information)

Administrative Duties

The RAC coordinator held discussions with personnel of the Department of Surveying and Land Information in Trinidad and Tobago. Identified requirements for instalment of satellite base station and equipment for the RAC. Arrangements were made with the Coordinator of the Centre for Geospatial studies regarding the installation of the RAC. To date the room to house the Regional Archiving Centre still needs to be cleared, a window installed and the shelving moved.

Prepared application for telephone line and submitted draft to the Head of the department for his signature. Application forwarded to Telecommunication Services of Trinidad and Tobago (TSTT).

Contacted second-hand warehouse to acquire furniture for the RAC. To date one (6x3x3.5) ft. desk was purchased on November 23, 2000. No additional furniture will be purchased until the room designated for the RAC can be utilized.

Finalized accounting procedure with the Manager, Engineering Institute (Mr. Winston Rajpaulsingh) on December 18, 2000. Prepared and submitted accounting report for the period November to December 2000.

Submitted payment to TSTT for installation of telephone line. Still awaiting installation.

Met with OAS, Trinidad, Administrative Assistant (Ms. Marina Piper) to discuss the VITEL shipment. Ms. Piper identified that the OAS, Trinidad office had already closed off accounts for the year, and that the driver was currently on vacation. In view of the situation and the eminent rental fee (for BWIA Cargo Bond to store goods) the RAC Coordinator took responsibility for the documentation and processed the handling charges. Transportation was hired to transport the equipment from the BWIA Cargo Bond, Piarco to St Augustine.

Training

RAC Coordinator received training at VITEL, Chantilly, Virginia, December 4th – 12th, 2000. A report of the training was prepared and submitted by the 22nd of December.

Component 2: Establishment of Databases and Information Systems

Information Systems Coordinator (ISC)

The ISC supported the Component 3 Inventory of Coastal Resources process through assisting in the oversight and facilitation of the consultants' activities. This responsibility was increased with the transfer of immediate responsibility for the management of C3 to the ISC.

SIDSNET

The ISC and the Technical Support and Communications Research Officer (TSCRO), Ms. Judi Clarke, prepared and submitted a paper to the Islands of the World VI Conference, Isle of Skye, 16-20 October 2000, describing and reviewing the implementation of the SIDSnet/CPACC Internet Training workshops in 10 Caribbean countries. This represents the final SIDSnet overview report.

Systems Procurement

Significant progress was realized in the acquisition of Internet computers for C1 contacts and computers for NFPs or other designated agencies. Computers have been purchased, ordered or at least vendors have been selected for all but three of the twelve countries. Additional information is required to finalize the purchase of computers for those three countries and this should be concluded in January 2001.

Training Program

All funds from this line have been utilized or allocated to other activities including the establishment of the RAC for C1 Data at the UWI, St. Augustine, Trinidad and Tobago.

System Implementation, Maintenance and Upgrading

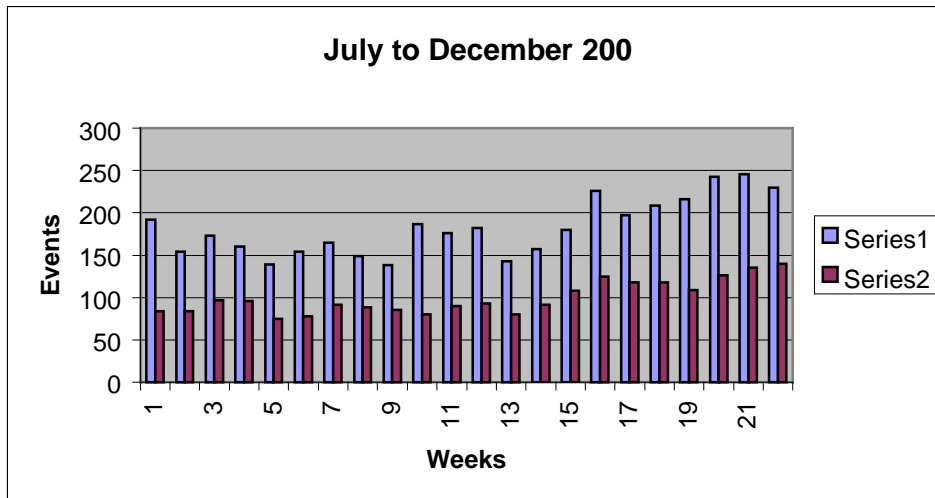
The Website has been kept current with reports and other documentation relating mainly to CPACC activities. Furthermore, country pages have been updated with NFP and component contacts and other country related information.

Generally, the website use has been consistent with the previous reporting period. Reviewing the number of hits per week, the statistics for current and recent past period were as follows (nb. some weekly information was not available):

- January to June 1999: average 84, high 137.

- July to December 1999: average 118, high 169.
- January to June 2000: average 161, high 217.
- July to December 2000: average 161, high 226.

The following graph illustrates number of hits (series 1) and associated hosts (series 2) from July to early December. Some hosts will be responsible for more than one hit.



Ms. Jennifer Watson, students at UWI, who assists the ISC in the maintenance of the website and the RPIU's computer systems continued to work on a part-time basis, although this was reduced due to the commencement of the University semester. General hardware and software maintenance and repair continued during the period. The Accounts Technician's computer had a memory upgrade to facilitate effective participation in the UWI on-line accounting network. Additional software acquired included upgraded virus protection.

An analysis of the RPIU's computer systems was contracted to ensure continued performance until the end of the project. This process has proven quite useful in addressing minor but difficult issues. Also, recommendations for more effective management of the RPIU's information resources were provided.

Replacement of a computer hard-drive from the St. Vincent and the Grenadines NFP system was necessary. This cost was met from the CPACC country allocation for general activities.

Component 3: Inventory of Coastal Resources and Use

Geographic Information Systems (GIS) Installation and Upgrade: Collaboration with Centre for Resources Management and Environmental Studies (CERMES) and Engineering Institute

CPACC support for participants to the 1-year modular program hosted at the UWI Campuses in Barbados and Trinidad and Tobago has concluded as participants have or are currently finalizing their final reports. This program has proven quite useful and participants found it very beneficial.

In addition to the purchase of computers for NFPs and C1 contacts, computers and GIS software for CPACC Repositories for the CRIS are to be purchased. The computers for the repositories have been purchased along with the other two sets of computers. As a result, only three countries remain to have computers ordered.

The purchase of GIS software has yet to be finalized. At a minimum, CPACC will be providing ESRI's Arcview 3.2 software to support the use of the CRIS. Countries were requested to indicate additional software required to facilitate the management and implementation of the CRIS. CPACC will be in a position to assist in this manner but the country requirements remain to be finalized.

Additional software necessary to support the CRIS management was identified, including MS Office 2000 Professional version. This software has been acquired with the computers. Although computers have mainly been acquired from local vendors the GIS software will be acquired from one of ESRI's distributors in the Caribbean.

In this area, given some institutional changes, there are a couple of cases where it is unclear whether the designated repository remains interested or is capable of managing the CRIS. These situations require careful review to ensure that the program is not lost for the countries involved.

Under this area, technical support was provided to a national metadata workshop in St. Lucia in November 2000 by meeting travel arrangements for Mr. Rajkumar Singh of the Environmental Protection Agency (EPA) in Guyana who provided the training.

Coastal Resource Inventory Systems

Originally, it was reasonably hoped that the CRIS could be concluded by the end of 2000 following the original and very optimistic July 2000. This later date has not been realized largely as a result of delays in acquisition of attribute and monitoring data, which have limited the ability of the consultants to finalize the design of the database. The scope of services for this project was divided into the following seven modules:

- Module I. Data assessment.
- Module II. Data cataloguing and metadata standards.
- Module III. Database design and management.
- Module IV. Data collection.
- Module V. Data automation/conversion.
- Module VI. Database implementation.
- Module VII. Metadata Training.

By the end of 2000, all but modules VI and VII were complete and the former was largely finished. The payments for the CRIS were linked to specific deliverables as listed:

- 10% upon UWICED's receipt of a copy of this Contract signed by the Consultant;
- 10% following delivery of the Inception Mission Report and the Data Assessment Report;
- 15% following delivery of Data Collection and Automation/Conversion Strategy Report;
- 10% following delivery of the Metadata Standard, Metadata Catalogue and Training Report;
- 10% following delivery of the System Requirements Report;
- 15% following delivery of the Data Automation Manual;

- 20% following Database Implementation and delivery of User's Manual, System Manual, and the final System Software and Databases;
- The final payment of 10% will be paid upon completion of all contract deliverables.

The only outstanding payments for the CRIS related to the reimbursables for documents and travel as well as 20% for the Database implementation and User's Manual and naturally the final 10%.

In addition to the CRIS contract, separate training contracts were agreed with the UWI and ESSA Technologies for the following activities:

- A Data Collection and Automation Workshop held in St. Lucia in March 2000.
- A Feature Extraction for Satellite Imagery Workshop held in Barbados in October/November 2000.
- A Database Design and System Maintenance Workshop for 30 persons held in Barbados in October/November 2000.
- A System Use and Decision Making Training the Trainers activity for four persons with the material to support follow-on workshops and seminars. This activity will likely be scheduled for early 2001.

Satellite Imagery

During this period the CPACC project acquired IKONOS 1 meter Pan Sharpened satellite imagery for eleven of the countries. Procurement of the imagery was handled by the OAS using World Bank regulations for international bidding. Specifically, an invitation to bid was sent to eight firms, four of who responded. The bid had to be revised based on the quotations received and again the same four firms responded. The successful firm was Niveles of Mexico.

In the case of Jamaica, CPACC could be making a proportional payment of US\$17,500 to the Government, which is acquiring similar quality IKONOS imagery to cover the entire country. In addition, the OAS made a contribution of US\$12,000 towards the purchase of imagery for St. Kitts and Nevis and Antigua and Barbuda, since the same imagery will serve multiple national agencies involved in another project executed by the OAS. The total cost for the imagery for the 12 CPACC countries therefore was US\$177,500.

Based on the completion of the contract for the imagery and the minimum delivery time, the full contract should be delivered in February 2001; although, it is expected that some imagery will be delivered before this date.

Component 4: Formulation of a National Climate Change Adaptation Policy

Significant progress was made during this period, with substantial interaction with country functionaries in the field. The final configuration of the implementation plan for this Component is as follows:

- Draft National Policy.
- Identification of climate change issues and Draft Issues Paper.
- Inception Mission – Issues Paper review and development of a work plan for National policy and Implementation plan.

- Finalization of Issues Paper.
- Country visits to develop draft National Policy and Implementation plan.
- National Consultations and Review by RPIU technical team to finalize National Policy and Implementation Plan.
- Regional workshop to develop Regional Policy.
- National consultations / review by RPIU technical team to finalize regional policy (for the summary of comments from in-country meetings see Annex 4).
- Presentation of National Policy and Implementation Plan for incorporation into national planning process.
- Presentation of regional policy to Council for Trade and Economic Development (COTED) for endorsement.

During the reporting period the following was accomplished:

- A template outlining the format and required content of the Issues Paper was circulated to all countries with requests to compile this paper using local resources.
- Inception mission to all CPACC countries.
- Draft Issues Papers from several countries were received by the RPIU technical team and formed the basis of discussions during the Inception Mission. In instances where progress on the compilation of the Issues Paper was minimal, information on the country's first national communications was utilized. To date, issue papers have been completed from Trinidad and Tobago, Barbados, Guyana, St. Lucia, Dominica and Belize. The Inception Mission also served to get countries to agree to a timetable for the development of the draft national policy and Implementation plan. It became evident during the course of these National Consultations that a key requirement in the development of the National Draft Policy will be an effective public awareness and education campaign in each country. The latter will also serve to heighten interest in the knowledge of climate change issues in the region. To this end, each country was tasked with developing a public awareness and education strategy for the implementation during the process of developing the draft of the National Policy. A few countries had already initiated some public awareness on climate change, through posters, brochures, lectures, competitions, etc. Focal points were provided with a CD produced by the EPA, on climate change facts, and it is expected that this tool will be used in outreach efforts, particularly to schools.
- A comprehensive Inception Mission report was prepared, and this consisted of:
 - Completed Issues Papers: Detailed country work plans for developing the draft National Policy and Implementation plan.
 - Reports on country consultations: This report has been circulated to countries for their review and comments and information has now been finalized.

Component 5: Coral Reef Monitoring for Climate Change

During the course of 2000 the national institutions responsible for coral reef monitoring and data processing and analysis, in the Bahamas, Belize and Jamaica, committed the resources and personal that, to a greater extent, ensured the coordinated monitoring of coral reefs and the processing and analysis of the resulting data.

The Centre for Marine Sciences (CMS) at the University of the West Indies, Mona Campus, and the CPACC RPIU, continued to develop the collaborative relationship that started in 1998. A sub-regional data management node for C5 was established and staffed within the CMS Data Management Centre (DMC). The Centre provided technical assistance in data processing and analysis to the Bahamas and Belize, as well as conducting progress evaluations in these countries in September 2000.

In keeping with the anticipated expansion of Component 5 activities to the eight remaining CPACC countries with coral reefs, the CMS DMS has changed its name and vision to the Caribbean Coastal Data Centre (CCDC).

In recognition of the level of collaboration between the CPACC Project and the CMS, and in anticipation of increasing role that the CMS will play in supporting C5 implementation, further discussions were held on the development of a memorandum of understanding (MOU) between the two entities.

During the reporting period consideration was given to the development of a funding proposal for the expansion of the CMS to support C5 activities to be carried out under the IMPACC Project.

Site Selection and Methodology

(a) The Bahamas

The Bahamas has carried out monitoring at two locations: New Providence and Abaco. At New Providence video monitoring was carried out at the Sea Viking (Nov, 1999 and Sep, 2000) and the Ridge (Dec, 1999) sites while at Abaco the Man Jack Cay (Sep, 2000) site was monitored. A third location has yet to be selected and monitored. One (Optic Stow Away) temperature data recovery. Another was deployed off New Providence and was retrieved in December 2000.

The Bahamas have been experiencing problems with regards to the availability of vessels and the cost of boat rental. In addition, there were problems associated with deploying staff members who already have a heavy workload, into the field for extended periods of time.

(b) Belize

Belize has carried out video monitoring in three locations Middle Caye at Gover's Reef Marine Reserve, Hol Chan Marine Reserve and South Water Caye marine Reserve. Belize had proposed to monitor additional sites during the latter part of the year (Hol Chan, Gallow point, Half Moon Caye and Babalar) but these were not done due to severe weather conditions.

(c) Jamaica

Jamaica has carried out video monitoring at three locations, Discovery Bay, Monkey Island in Portland and Southeast Cay at the Port Royal Cays.

P. Wilson-Kelly of the Natural Resources Conservation Authority (NRCA) presented a report to the UNFCCC Steering Committee meeting (July 6, 2000) on the video monitoring of the three sites in Jamaica. He at this time indicated that the NRCA were considering a second monitoring exercise for 2000. He was, however, advised to await the results of the initial monitoring exercise.

Data Processing and Data Analysis

Pilot Countries

(a) The Bahamas

Two CDs containing the dotted and undotted images from the sites monitored were received at the CCDC. Some amount of data processing and analysis has been carried out in the Bahamas but no data entry sheets have been sent to the CCDC.

(b) Belize

The CPACC computer at the Coastal Zone Management Authority and Institute (CZMA/I), Belize had to be reformatted and the required software reloaded. Jeff Miller provided Ms. Bood of the CZMA/I with a copy of the "Protocol for Video (data processing) Methods". Data processing and analysis for Hol Chan and South Water Caye were completed, however the exercise for south Water Caye had to be repeated because of problems associated with the random dot plotting process (see Quality Assurance /Quality Control section below). Images for Glovers Reef were captured and dotted in Jamaica and sent to Belize for processing and analysis.

(c) Jamaica

Data processing and analysis for Discovery Bay and Portland were completed. Port Royal was 50% completed.

Caribbean Coastal Data Centre (CCDC)

Modifications were made to the data entry sheets originally designed by Jeff Miller to better provide the information required for identifying and quantifying the trends of climate change impacts on the reefs. Changes were made to the substrate category codes to follow those employed by the CARICOM Productivity (CARICOMP) project. A revised data entry sheet template was also received from Jeff Miller and discussions on the modifications to the data entry sheet were held with him. The summary tables were updated to include more information about coral bleaching and coral diseases. An additional feature was include, that of the *Shannon Weaver* diversity index for each transect and well as for each site. It is anticipated that further refining of the CPACC data entry sheets, to include some of the new features developed by J. Miller and to make them more site/country specific, will take place after the first data sets are evaluated.

The information posted on the Internet about *PointCount'99* software was reviewed with a view to comparing it to the present method being utilized by CPACC. *PointCount'99* is a Win95/98 based PC program developed for the US EPA's Coral Reef Monitoring Project (CRMP) to utilize the random point count method for accurately estimating percent coverage of corals, sponges, and associated substrate from digitally frame-grabbed underwater video images. Discussions with Jeff Miller indicated that this program does not entirely meet the needs of the CPACC's coral monitoring program.

Archiving Data

A list of CD's and tapes storage at CPACC/CMS is kept in the Archives. A comprehensive list of C5-data files is also kept.

Quality Assurance/Quality Control (QA/QC)

A draft QA/QC document was prepared in which captured frames were used to demonstrate correct and incorrect monitoring techniques that would ultimately affect the accuracy of the data. The final document will be useful to persons actually involved in video monitoring in the field.

A draft substrate identification manual was prepared with the assistance of Ms. Judith Mendes (Marine Biology Ph.D. candidate) to show how the different substrate categories appeared in the captured images. This document will be especially useful to those people conducting the data analysis, particularly if they did not conduct the video monitoring themselves.

All three pilot countries experienced problems with the *random plot dotting process* and were initially unable to fit the random plot exactly over the image. Considerable time was spent in resolving this problem, after which the captured images had to be redotted and in the case of Belize the data analysis repeated (for South Water Caye).

The latest draft of the document "*Using Videotape to Sample Coral Reefs*" by Jeff Miller (The US Geological Survey, Biological Resources Division, October 2000) was received. It includes modifications to the previous document and is available for posting on the CPACC website.

Internet-based Coordination and Information.

A new *e-group* entitled *C5-Monitoring* was established specifically to discuss issues related to C5. It is expected that this new *e-group* will be smaller than the *Climate Change-reefs (cc-reefs) e-group*, and that members will be more willing to openly share experiences and discuss problems associated primarily with C5.

Feedback and Recommendations

Participants from Jamaica and the Bahamas have expressed the desire to have a workshop to review the activities and challenges of the program with a view to refining the methodology and techniques for future monitoring. It was felt that the exchange of experiences and solutions would be beneficial to the pilot countries as well as the other CPACC countries that are expected to implement coral reef monitoring in the future.

It was suggested by the Bahamas that a meeting be held to coordinate activities between the related components of CPACC.

There was also the feeling that the communication between the pilot countries and the RPIU could be improved.

The *cc-reef e-group* should be used more a promotional tool to focus on the activities of CPACC within the Caribbean and to disseminate information related to the coral reefs and climate change.

An assessment of the merits of the video monitoring methodology as compared to the other commonly used coral reef monitoring techniques needs to be carried out. Data from the

Discovery Bay reef in Jamaica could be used to compare methodologies as both CARICOMP and CPACC use the same sampling sites.

Other Activities

(a) Meetings, Conferences and Workshops

UNFCC Project Steering Committee, Jamaica. The Coordinator represented CPACC at these meetings.

AGRAA 2000 Workshop, Jamaica. This workshop was held from August 1st to the 6th, 2000 in Discovery Bay. The aim of the workshop was to train persons in the Rapid Assessment Protocol (RAP) which was used to evaluate the condition of a large number of reefs even when no previous data are available. Site assessments took place during the two weeks following the workshop at various locations (Port Antonio, Negril, Ocho Rios and Montego Bay) around the island. Attendance at this workshop had to be cancelled due to scheduling conflicts.

C5 Presentation, World Bank, Washington, D.C., USA. On September 12, 2000, the DPM/CZMS made a presentation on C5 to an audience comprising representatives from the World Bank. The presentation was one of two given by CPACC Component Managers, the other being a C1 presentation given by Lee Chapin on September 11, 2001. Both presentations were organized by Walter Vergara, World Bank.

The 9th International Coral Reef Symposium. The Coordinator attended the 9th International Coral Reef Symposium, in Bali, Indonesia during October 23 to 27. Information packages, brochures and posters on CPACC were distributed at the symposium through the booth hosted by the Bahamas. Attempts were made to have the visit to the symposium covered in the local media but the timing of the information sent to the press resulted in only two short general articles on the impact of climate change on coral reefs appearing in the Herald (Nov. 12) and the Observer (Nov. 20) newspapers. Highlights of the symposium were prepared and posted on the *cc-reef e-group*.

CRIS Database Design and System Maintenance Workshop, Barbados. The Coordinator attended two days (November 1-2) of the CRIS Database Design and System Maintenance Workshop in Barbados held during the period October 30 to November 3. The topics covered at the sessions attended were Relational Database Design and Using and Customizing the CRIS.

Workshop on Climate and Island Coastal Communities, November 6 to 8, 2000 East-West Centre, Imin Conference Facilities, Honolulu, Hawaii.

The Deputy Project Manager/Coastal Zone Management Specialist (DPM/CZMS) attended the three day workshop along with some 132 specialists representing government, business, scientific institutions, non-governmental agencies and communities throughout the islands of the Pacific (both independent and US territories) (118), the insular Caribbean (2) mainland United States (9), and New Zealand (2) were invited to participate in the Workshop on Climate and Island Coastal Communities.

The workshop was organized by the East West Centre as part of an 18-month Pacific Islands Regional Assessment Project funded by the National Science Foundation on behalf of NSF, NOAA, the National Aeronautics and Space Administration (NASA), and the U.S. Department of the Interior. The results will be included in the final report of the first National Assessment of the Consequences of Climate Variability and Change for the U.S., which is being organized by

the U.S. Global Change Research Program under the auspices of the White House Office of Science and Technology Policy.

The opportunity was taken to hold discussions with coral reef professionals attending the workshop. Networking activities included discussions with:

- Kevin Parnell, Visiting Colleague, Department of Geography, University of Hawaii (kparnell@hawaii.edu).

Mr. Parnell has conducted research on coral reef hydrologics. He has agreed to send copies of his papers to the CPACC RPIU in December 2000. He will also attempt to get papers on reef crest hydraulics published by his colleague, Harry Roberts, at Louisiana State University. This information will be used to inform CPACC's coastal vulnerability scenarios, and to provide interpretive content for public awareness and education materials.

- Robert Richmond, Professor of Marine Biology, University of Guam Marine Lab, Guam:

Arising from discussions on a universal classification system for defining coral reef health, Prof. Richmond offered to send a reef health checklist that he had developed.

Prof. Richmond advised that a regional coral reef web site will be launched in December 2000, and suggested web links with the CPACC site.

It was agreed that CPACC and entities involved with coral reef monitoring in the Pacific would adopt a collaborative approach to their work.

General:

Coral reef managers in discussions about coral reef monitoring and data processing methodologies pointed out the limitations of the Point Count coral reef data processing software application. The CPACC Project will be put in contact with individuals who have first hand experience of the problems with the Point Count software application. This information is useful because it has been occasionally suggested that Point Count be adopted by the CPACC Project to replace the custom made utility that has been developed with the assistance of Jeff Miller. These recommendations have been made on the non-stated assumption that Point Count is problem free.

CPACC will be provided with a CD on coral reef taxonomy as a possible guide for developing the format for the C5 coral reef taxonomy guide for CD and the web.

Follow-up Actions:

Establish and maintain collaborative working relationships between professionals and institutions involved in coral reef monitoring and management in the Pacific and their counterparts involved in C5 (DPM/CZMS, C5 Coordinator).

Perform a comparative review the Point Count software utility with the aide of information from users (DPM/CZMS, C5 Coordinator).

Establish web links between the CPACC website and web sites for coral reef research and monitoring in the Pacific (DPM/CZMZ, ISC).

- (b) Regional Node for UNEP.

Discussions were held with Alessandra Vanzella-Khouri of UNEP concerning the next production of the "Status of the Coral Reefs of the World" book slated to be published in 2002, which will be presented at the next meeting of International Coral Reef Initiative (ICRI) to be held in the Philippines. UNEP is looking for an organization such as CPACC to be the Regional Node for the Northern Caribbean (Jamaica, Bahamas, Turks and Caicos, Cayman, Cuba, and the Dominican Republic) to track the monitoring activities in this region. She indicated that there was the possibility of funding to assist with meetings and training.

(c) C5 Media Profile

Discussions were held with Mr. Desmond Allen of Jampress with respect to getting articles on the activities of CPACC and information on climate change and its impact on coral reefs printed in the media. Mr. Allen was one of two Jamaican journalists who participated in the Regional Media Consultation hosted earlier this year by CPACC. In light of this an outline for a series of articles entitled "Coral Reefs in Peril" was drafted for review.

(d) Office Facilities

The furniture for the office has been fully installed. The technical difficulties associated with the computer have been overcome except for one error message, which keeps recurring. The CPACC computer has been connected to the UWI network and the Internet and email facilities established. The setting up of the phone system in the new office has undergone a number of setbacks but is now fully in place with the CCDC having a straight line and 2 dial-9 lines. Long distance overseas calls have to be done through the main office of the CMS.

Institutionalisation of Component 5

A draft Memorandum of Understanding (MOU) defining the collaborative relationship between the CPACC Project and the CMS at the UWI, Mona, Jamaica has been developed (Annex 5). Final approval and signing of the MOU is scheduled for March 2001.

A similar MOU will be developed between the CPACC Project and Eastern Caribbean institution (e.g., the Marine Resources Environmental Management Program (MAREMP) at the Cave Hill, Barbados Campus of the UWI, or the Coastal Zone Management Unit in Barbados) to provide a sub-regional node to provide technical support to the CPACC countries in the Eastern Caribbean during the expansion of C5 under the IMPACC Project.

Discussions regarding the role of the CMS in ongoing C5 activities under CPACC/IMPACC/CCCC took place at the CMS in Jamaica on October 5, 2000. Further discussions will take place in 2001 with the aim of clearly defining the role that the CMS will play in regional climate change research and adaptation planning for sustainable coastal ecosystem management.

Component 6: Coastal Vulnerability and Risk Assessment

Collection of Information

Component 6 has progressed quite well during the period July –December 2000.

(a) Guyana

In Guyana data collection has continued, with the socio-economic report being completed. Coastal analysis in Guyana has also continued, with good progress being made. Hydrological analysis has also started with initial data gathering. A consultant was hired to facilitate this

data gathering. A consultant has also been hired to do legal analysis in Guyana and this work has progressed quite well.

(b) Barbados

In Barbados hydrological data analysis continued with local consultants being recruited to assist with this local analysis. Beach erosion work continues with data collection and analysis continuing at the coastal zone management unit in Barbados. No socio-economic work has been initiated as yet. The legal work in Barbados has been completed. The socio-economic work is expected to be completed in early 2001.

(c) Grenada

Work in Grenada has also progressed at a good rate with draft reports with respect to the legal analysis, beach erosion and socio-economic analysis being completed. The hydrological analysis is ongoing with good progress being made. A consultant was hired to training with regards to beach erosion analysis in Grenada and Guyana as well as to assess the progress of C6. The training was well received by the countries.

Component 7: Economic Valuation of Coastal and Marine Resources

The Component is specifically assisting participating countries to apply the tools of resource valuation, environmental accounting, and environmental decision-making for use in the development of policy frameworks and economic and regulatory approaches within the context of the coastal and marine resources and CPACC objectives.

Phase I:

(a) Methodology Definition

Completed. Since June 2000 progress has continued in the implementation of Phase II, *Implementation of the Pilot Study*. During that period, the following has been accomplished:

(b) Finalization of Methodology

Completed. During the operationalization of Phase II there has been some continued discussion of the main areas to be studied in each country. At the end of December 2000, these were clarified. A copy of the methods to be carried out in each country is attached as Annex 6. Country visits carried out during the reporting period further clarified any issues associated with techniques. The availability of data in some cases necessitated the reorganization of issues or areas of focus. Following a country visit in December 2000, it was decided that a wide-based survey of the terrestrial park in Dominica was not required but that the effort would be focused more on the Marine Park and direct use values. Reports on the pilot studies have been developed by each country and were presented at a joint C7/C8 workshop held in August 2000 and are provided on the CPACC webpage.

Data Collection

Data collection have been implemented on two levels: primary and secondary data collection.

Progress in the pilot countries:

(a) St. Lucia

In St. Lucia, 75% of all data has been acquired. The fisheries data and the tourism data were the more recent additions to the data set for St. Lucia. After much discussions and revision, the two surveys (Beach User on site Survey and Telephone Survey) to be carried out in St. Lucia on beach use and the value of the area – nationally have been completed and should be administered in early 2001.

(b) Dominica

In Dominica, since the contracting of a local Coordinator for C7, significant progress in data collection has been achieved. At the end of 2000, Dominica had collected 90% of the data required. During a visit with the Consultant, Professor Strand, after a Coordinators Meeting in December 2000, the remaining issues associated with the data for Residential, Commercial and Public properties within the Newtown Area of the pilot site were addressed. The remaining data needs are expected to be addressed through a survey of dive operators operating in the Soufriere Marine Park.

(c) Trinidad and Tobago

Trinidad and Tobago has made more limited progress in addressing data collection. Given the nature of the study in terms of the industrial site, there has been some difficulty in extracting data from companies.

The issues associated with data collection were one of the main issues discussed and addressed in a follow-up country visit held in January 2001. A comprehensive plan has now been put in place including arrangements for the administration of surveys and it is hoped that most of the data collection would have been finalized for Trinidad and Tobago by mid to the end of February 2001.

Though data collection has been slow during the first few months, significant progress has been made and data collection should be finalized by early March 2000.

Harmonization of efforts with Component 3

Efforts continue to ensure that data collection efforts are in harmony with the activities ongoing in C3 in the development of the CRIS. There was some follow-up between the ISC, the CPACC Focal Point and the CPACC C7 Coordinator.

Coordination

The establishment of National Component Teams and C7 Focal Points has been an effective way for communication, logistics and overall coordination of the countries. It has also facilitated more direct participation by the countries in the C7 pilot and should facilitate the sustainability of capacity-building efforts in these areas. The Coordinator for Dominica came on board in August 2000 and through his efforts, progress in Dominica has been significant.

The establishment of these teams is also expected to facilitate the sharing of information with Component 8, which is also underway and provide linkages for C7 outputs into the C4 process. In addition, public awareness activities have been coordinated through the NFP and the C7 Coordinators and ensured a useful flow of information.

The equipment of the virtual office to be established in St. Lucia has been ordered and should be officially launched early February 2001. This office is to be a subregional node for economic valuation, serve as a repository for the C7 data and be a communication link for the three participating countries.

In an effort to foster discussion and debate on economic valuation an *e-group* was established under the management of the RPIU: this continues to be maintained as a source of discuss and interaction.

Training

The main training activity during the reporting period was the hosting of a joint workshop in St. Kitts and Nevis on “Economic Decision-making tools for Climate Change Adaptation Policy” August 28th to September 1st, 2000. The workshop was well attended by participating countries and by other CPACC countries.

The meeting served as an opportunity to establish harmonization between C7 and 8 as well as to encourage decision-makers into a methodology whereby economic valuation and the development of regulatory and economic instruments should be part of the overall decision-making process. Participation also came from the World Bank, the private sector, i.e. the solar-water hearing sector in Barbados, the NGO community – The Montego Bay Marine Park Trust and the Organization of Eastern Caribbean States/Natural Resources Management Unit (OECS-NRMU). The participation of these institutions brought practical implementation issues and raised options in the use of these techniques to every-day problems. The National NOAA of the US government, as Technical Coordinator for Component 8, also participated. A comprehensive report of the discussions at the workshop is being produced. A number of the presentations have been already made available via the CPACC webpage.

On a continuing basis, information on valuation work as well as other areas is passed on to the Component Teams.

Although it was anticipated that most of the data collection for C7 would have been completed in December 2000. However data collection remains a challenge in some areas. This should be addressed in early 2001.

Component 8: Formulation of Economic/Regulatory Proposals

The general progress of implementation of the component has been satisfactory despite some delays in the design of the pilot instruments and the review of appropriate regulations and legislation in country. Since the end of May 2000, the project has begun to address Phase II: *Implementation of Pilot Studies*. Specifically, during this period, implementation has focused on the formulation of instruments and the finalization of a methodology. These have been critical steps in the process towards defining a pilot implementation strategy.

Formulation of Instruments

The RPIU and US NOAA jointly carried out a number of country visits to follow-up on methodology development and to provide technical support to the country teams at strategic points in their deliberations.

As part of the pilot implementation process, Project Local Consultants were identified and contracted to work on pilot implementation at the country level. The operation of the Project Local Teams has been quite successful. The teams have been operating well within the implementing schedule and maintained a cohesive group of participants in the Component Team. The Component Teams that have been coordinating efforts at the local level are cross-sectoral and have been committed to both the project and its long-term possibilities.

As part of the process towards identifying potential issues to be addressed at the national level and potential instruments, one day consultations were held in June 2000 in which the RPIU and NOAA participated and acted as co-facilitators. The meetings were well attended and discussions proved extremely fruitful. The meetings also resulted in a continued training on economic instruments and their different applications. Specifically the consultations resulted in:

- The identification of options for addressing the issues identified;
- The identification of potential pilot instruments and potential issues regarding its implementation; and
- Discussions on the potential scope of the pilot implementation strategy.

Further discussions have been held with on the development of a pilot implementation strategy. A strategy has now been identified for each country. Included in the strategy is a process for building awareness and seeking political endorsement of the process.

Methodology Finalization

As part of the methodology finalization process, the Project Local Consultants have been employing meetings and consultations with various ministries and stake-holders.

In Antigua, the Ministry of Environment is expected to take the lead in implementing the instruments. In St. Kitts responsibility is expected to be shared by the Ministry of Health and Environment and the Ministry of Tourism.

Training and Capacity-Building

As part of the ongoing process, training and capacity building in this area is incorporated into daily activities. Further local and sub-regional workshops and consultations will be used as fora for further training.

The main training activity for the reporting period was the joint workshop with C7 hosted by St. Kitts and Nevis. The workshop was successful and was a strategic meeting in terms of discussing the potential opportunities for both economic valuation and implementation mechanisms in the decision-making process and the contribution that they could make to climate change adaptation policy development. It is expected that this will be useful in terms of the C8 contribution to the C4 process but also in every-day decision-making processes.

Pilot Instruments

The two participating countries defined their pilot instruments in terms of addressing their specific problems.

(a) Antigua and Barbuda:

In addressing "Sand at Risk", it is proposed that:

- A middle market for sand is developed wherein sand would be sold in small bags and not just in loads. This it is proposed would reduce the inclination for the removal of small amounts of sand in Antigua for household repairs, etc. and still maintain the current market, which is important to Barbuda.

- An organization/body would be developed to address the management of sand as a resource and not just sand as a mineral. This would also involve a change in operational policy, which is also being discussed by the team.

(b) St. Kitts and Nevis:

To address the issue of “Sustainable Development in the Coastal Zone” the team has recommended:

- The development and implementation of a GreenLeaf certification program;
- The implementation of the draft setback guidelines; and
- The assessment of the viability of a performance bond. It has been suggested that the present tax holidays would be extended due to compliance with the GreenLeaf certification program.

Public awareness has also been discussed regarding implementation of the pilot programs and ensuring both compliance and sustainability. One proposal theme for radios and public service announcements (PSAs) was the theme “If Sand Could Talk”.

Sustainability of the C8 activity

As regards, sustainability of the program, the proposed plans have been presented to the Prime Minister of Antigua and Barbuda. A similar presentation to the Minister of Health and to the Cabinet is expected to be carried out in both countries.

Coordination

A C8 Coordinators Meetings was held in October 2000 to discuss C8 implementation and revise the projected plan for implementation. The meeting was also useful in ensuring communication and sharing between the two countries and also to begin the process for discussing proposals with high-level decision-makers. It is expected that such meetings will be held at strategic periods to closely follow and maintain progress.

Despite delays in the execution of some activities and the usual delays in a consultative process, a number of outputs have been achieved in this period. In some cases, a specific effort has been made to include important agencies and sectors, which has extended the process, in some areas.

In order to ensure an adequate pilot implementation process, the pilot phase has been extended to middle of 2001. It is felt that the project needs at least six months to achieve material results and to develop a process, which can be maintained and further fostered by the national government.

Achieved outputs include:

- (i) The identification of pilot instruments;
- (ii) The development of a collaborative network between C7 and 8;
- (iii) Establishment of high-level support for the proposed instruments in at least one country; and
- (iv) Draft Pilot Implementation Methodologies developed by each Component Team.

Component 9: Greenhouse Gases Inventory/Agriculture and Water Resources Vulnerability Assessment

The Initial National Communication of St. Vincent and the Grenadines finally received approval of the government, and was printed during the reporting period. The report was officially presented by the Technical Coordinator of CPACC in the name of the NFP of St. Vincent and the Grenadines at a special presentation for the Caribbean at the COP6 in the Hague in November 2000 along with Grenada, Guyana and Jamaica. Both a printed copy and an electronic version were handed over the UNFCCC Secretariat.

Annexes

ANNEX 1: World Bank Supervision Mission Report

ANNEX 2: Concept Note for IMPACC

ANNEX 3: Meeting on the CCCC

ANNEX 4: Component 4 Issues Report

ANNEX 5: MOU for Collaborative Management in the Implementation of Component 5

ANNEX 6: Component 7 Data Collection

Annex 1: World Bank Supervision Mission

This was the fifth World Bank supervision mission since CPACC's effectiveness. An aide memoire was prepared and is enclosed for more information. The main objectives of the World Bank mission were to review progress to date on project implementation, review financial management arrangements, and discuss possible follow-up activities. The Bank commended the OAS and the RPIU staff for their dedication to the project.

Project **overall implementation performance** was rated satisfactory. The Bank noted that all project components are under execution, albeit with some delays. These delays have caused a bunching of project implementation activities towards the end of the project, which may create some problems. For the remainder of the project, there is an acknowledged need to increase the pace of execution and consequently the rate of disbursements. All major participants in project implementation, namely OAS/USDE and RPIU, will be required to optimise staff time by setting distinct priorities and deploying the maximum manpower to the field in support of the implementation of the different components.

Major assessment points brought up by the World Bank and required actions by OAS/USDE and RPIU include:

- The project continues to strengthen the Caribbean region's capability in preparing to cope with the adverse effects of climate change.
- Capacity building activities have contributed to enhancing the technical expertise of professionals and sensitisation of policy makers about climate change impacts.
- CPACC continues to expand its role as a focal point for supporting efforts to bring forward a sustainable development agenda for the region.
- One of the strengths of the OAS and RPIU management is their ability to network, especially in international arenas. The Bank encouraged the management team to allocate significant time in the coming year to meet with potential donors and to identify future sources of financing to sustain CPACC.
- Indicators of success for each Component was discussed and revised.
- It was noted that the pace of disbursements has increased since the Fourth Supervision Mission. A plan of operations would be developed by the OAS and RPIU and presented to the Bank by the end of 2000, early 2001.
- The overall assessment of the project's financial management was found satisfactory.
- The World Bank indicated its commitment to working with the RPIU and OAS on IMPACC and the establishment of the CCCC.
- A plan was developed for the execution of activities associated with the further development of CPACC and the CCCDF proposal.
- There was agreement on the establishment of the Centre by mid 2001 with CARICOM taking the lead.
- There was agreement on the need for strategic approaches to COP6 and 7.

Annex 2: Concept Note for IMPACC

Mainstreaming Climate Change in Development *A Vision for the Caribbean sub-region*

Climate Change: A Priority Issue for the Caribbean

Caribbean Small Island States, like other SIDS, share a number of challenges, such as a heavy economic and social reliance on fragile ecosystems, susceptibility to the vagaries of international trade, lack of economies of scale, high transportation and communication costs, substantial vulnerability to natural disasters, scarce land resources, and limited capacity to manage and use natural resources on a sustainable basis. Affected by an intensification of hurricanes since 1995, many of the Caribbean SIDS are facing situations in which scarce resources that were earmarked for development projects have to be diverted to relief and reconstruction activities following disasters, thus impeding sustainable growth.

Recent findings by the Inter-Governmental Panel on Climate Change (IPCC) and other scientific organizations confirm that the most serious long-term environmental challenge facing Caribbean SIDS and low lying coastal states is that of Global Climate Change and its impact on the socio-economic welfare of these nations. Coastal areas, their population and economic activities will be threatened by the anticipated sea-level rise. Already faced with a crisis in managing limited freshwater resources, changes in rainfall patterns, forecasted under the baseline climate change scenarios, could result in disastrous consequences affecting tourism, agriculture and health. Increasing climate variability is expected to lead to more frequent and intense tropical storms.

The Caribbean Planning for Adaptation to Global Climate Change Project (CPACC)– a Regional Approach to Climate Change Adaptation

The GEF-funded CPACC Project (1997-2001) is being executed by the Organization of American States (OAS), in partnership with University of the West Indies Centre for Environment and Development (UWICED), for the World Bank as the GEF Implementing Agency. The project's overall objective is to support Caribbean countries in preparing to cope with the adverse effects of GCC, particularly sea-level rise in coastal areas, through vulnerability assessment, adaptation planning, and related capacity-building.

The Project has developed a successful model of regional cooperation in addressing the countries' concerns with the impact of climate change. As a *Stage I Enabling Activity*, it is focused on creating awareness and on organizing training in skills relevant to impact assessment and adaptation planning; the collection and dissemination of sea level and climate data in each country; pilot site impact and vulnerability studies; and the formulation of policy options to address adaptation issues.

Specific achievements include:

- a) Establishment of a sea level and climate monitoring system. The eighteen monitoring stations installed in 12 countries, and the related information network, have improved monitoring and evaluation capacity in the region as a whole, at a time when hurricanes grow in intensity and frequency. The data's primary use is to document sea level rise and changes in sea surface temperature (SST), thus assisting in the global monitoring on the impacts of climate change. Additional applications in areas such as shipping, tourism and monitoring of extreme events are being promoted.
- b) Improved access and availability of data. The systematic compilation of coastal resources inventories and the monitoring of coral reefs have contributed to an extensive and integrated database for climate change monitoring, accessible to a wide range of environment and development agencies in each country.

- c) Increased appreciation of climate change issues at the policy-making level. CPACC has made policy-makers, decision-makers, technical personnel and the wider public more aware of climate change and climate variability, and has increased the appreciation for the complexity and integrated nature of climate change issues. The project has enabled a more unified and better documented positioning of the region before the Convention and the Conference of Parties.
- d) Meeting country needs for expanded vulnerability assessment. Pilot vulnerability studies have expanded the knowledge of vulnerability assessment tools and methods and have facilitated an increased awareness of the most physically vulnerable sectors in the Caribbean sub-region
- e) Establishment of coral reef monitoring protocols. Coral reefs have proven to be true barometers of climate change. As a result of ongoing efforts within CPACC, monitoring and early warning capabilities should be significantly enhanced. The data is assisting in documenting the pace of coral bleaching and impacts on coral reefs caused by changes in SST.
- f) Creation of a network for regional harmonization. Through its collaborative efforts with a number of existing agencies (i.e. the Caribbean Tourism Organization (CTO), the Caribbean Alliance for Sustainable Tourism (CAST), the Centre for Resource Management and Environmental Studies (CERMES) of the University of the West Indies, the Caribbean Energy Information System (CEIS), the Caribbean Development Bank (CDB), the Caribbean Conservation Association (CCA), the Caribbean Environmental Health Institute (CEHI), the Caribbean Disaster and Emergency Response Agency (CDERA), private sector interests such as Petrotrin of Trinidad and Tobago as well as the insurance and banking sector) CPACC is introducing climate change as a factor in these agencies' agendas, and is establishing programmatic linkages between CC and other activities.

Beyond a Project to a Programmatic Approach

A key objective of CPACC is the sustainability of regional climate change activities at the conclusion of the project. As the implementation of the project progresses and understanding and awareness of the region's vulnerability grows, the main question that remains unanswered is how Caribbean SIDS will manage and respond to the specific technical and policy-related problems associated with global climate change and its adverse impacts.

Increasingly, adaptation is being recognized as the mechanism for the "survival of those most threatened" by a hotter planet. The CPACC project, through its network of national government agencies, private sector representatives and regional institutions, is now recognized as a regional force in addressing climate variability and change issues and their effect on the economic, social and cultural development in the Caribbean region. With the project's help, the region has begun to resolve serious conflicts, which have long constrained its sustainable development, and begun to tackle issues such as the consequences of aggressive development in coastal and marine areas.

The Regional Project Implementation Unit (RPIU), established at the University of the West Indies in Barbados for the implementation of CPACC, has assumed responsibilities beyond the strict implementation of the CPACC Project. The RPIU is increasingly participating in the regional debate on climate change, and country agencies solicit the advice and technical support of the RPIU in this area. The RPIU has also become a focal point for discussions on the Kyoto mechanisms and technical support for the Conference of the Parties.

It is in this context that the political directorate of CARICOM has called on the institutions that are implementing CPACC -- the World Bank, the Organization of American States and the University of the West Indies -- to continue and broaden its efforts in assisting CARICOM member states with adapting to Global Climate Change. A programmatic approach is called for. It would consist in (a) a successor project to CPACC, entitled ***Implementing Adaptation to Climate Variability and Global Climate Change in the Caribbean (IMPACC)***, which would have as its principal objective to mainstream climate change in the development agenda of the participating countries, building on the

experiences gained under CPACC; and, (b) the establishment of a permanent mechanism for addressing climate change in the region, in the form of a ***Caribbean Climate Change Centre***.

Mainstreaming Climate Change Issues with IMPACC

The capacity building started under CPACC has focused, by design, on climate change adaptation issues and project-related technical skills. In order to make it sustainable, it needs to be deepened and broadened, and fully integrated into the development agenda of Caribbean SIDS. Mainstreaming Climate Change issues will be the central objective of IMPACC. Specific areas that will be addressed under IMPACC are:

- *Extending the use of climate data to a broad range of sectoral applications:*

While the primary objective of the CPACC sea-level and climate monitoring stations is to document the impact of global climate change, the data collected have a variety of practical local applications in such areas as tourism, coastal shipping, agriculture, emergency management and the assessment of climate risk in the insurance and banking industry. These applications are essential for sectoral planning as well as to the design of adaptation activities. Opportunities for such applications were identified during CPACC, and several were developed on a pilot basis. Further investments are needed to strengthen the monitoring network to fully exploit these opportunities, and to extend the capacity building in national agencies to support these new applications.

- *Downscaling of global climate models in support of decision making on adaptation at the country and regional level:*

The region needs to develop capacity to downscale the global climate models and to develop their own regional climate models in order to be able to make more accurate projections on-site specific climate change in the Caribbean. Under CPACC a network of Caribbean experts has been formed at the University and CIMH to address this issue. This network would be the focus of an intensive program of capacity building under the new project to develop relevant applications of climate model outputs to serve the sustainable planning needs of key sectors in the region.

- *Supporting the countries in using Carbon Trading to promote their sustainable development agendas:*

Carbon trading offers opportunities for the mobilization of resources and mechanisms of technology transfer that can play a vital role in assisting the countries with integrating adaptation in their sustainable development agendas. Capacity building, developing a regional approach to establishing baselines and benchmarks, and assisting the countries to formulate investment-grade projects to develop their renewable energy resources are activities that will be supported under the new project.

- *Systematic integration of climate change considerations into the development planning and investment processes in the public and private sectors:*

IMPACC will work directly with specialized agencies and departments in key economic sectors such as tourism, agriculture, forestry, energy, land use planning, insurance and financial services to incorporate climate change impact and risk assessment in their ongoing programs and long-term planning. Specific areas of activity will include:

- a) Expanding disaster management to include vulnerability reduction. There is a synergy between the actions aimed at reducing near-term risk of climate variability and extremes (natural hazards) and those aimed at reducing the long term risk of climate change. IMPACC will work with economic planning agencies and sector agencies to develop a methodology for explicit consideration of risk from long term climate change in the economic evaluation of investment projects. Appropriate climate change adaptation measures will be

identified that could be implemented in the context of planned investment projects or post-disaster reconstruction projects;

- b) Strengthening the water resources planning boards to include the analysis of climate change impacts on freshwater availability (both reduced precipitation as well as Stalination of fresh water lenses). Under stage 2 adaptation this could include the identification, formulation and implementation of selected measures that would enable the local economies to adapt to reduced water supplies and seek to increase its supply;
- c) Assisting the fisheries departments to understand the impacts of shifting fish grounds, impact on total stocks and the bleaching and death of coral reefs. Under stage 2 adaptation this could include identifying and implementing measures that would enable the fisheries and tourism sector to develop economic alternatives for their sectors;
- d) Improving the understanding of the implications of climate change and their impacts on local crops. Stage 2 adaptation could include strengthening the analysis and planning capacity at the agricultural departments, and assisting in the identification and development of crops and agricultural practices best suited to conditions resulting from climate change; and
- e) Revamping land use planning and coastal zone management. Under CPACC, the focus has been on coastal zone management as a strategy for adaptation to climate change and sea-level rise. Stage 2 adaptation could include the analysis of the implication of sea-level rise and climate change on land use planning nationwide. It also could support the systematic identification and formulation of cost-effective options for protection and retreat in the face of sea-level rise and the redesign of infrastructure to meet future climate change impacts (levies, drainage works, road infrastructure).

Establishing a Permanent Mechanism to Address GCC in the Caribbean

The need for a permanent mechanism has been the topic of extensive discussions by CPACC with project national focal points, representatives of the countries' public and private sectors and of regional institutions. The concept of a regional mechanism, in the form of a Caribbean Climate Change Centre, has received endorsement from the CARICOM Heads of Government at their meeting in July 2000. The mission of the Centre would be to support the CARICOM countries in addressing the challenges to their sustainable development created by global climate change. The Centre will also serve as executing agency for regional climate change projects of interest to the countries, starting with the IMPACC project.

The Centre will likely take the form of an articulated network, with the University and other key regional agencies as full members of the network. It will encourage and assist regional agencies in the network to incorporate climate change considerations into their existing portfolios. It will grow out of the CPACC Regional Project Implementation Unit (RPIU), and be staffed by a small number of professionals, with the necessary administrative and support staff. The Centre will not impose any financial obligations on the CARICOM countries, but will finance its operational costs through the delivery of services, including acting as executing agency for regional projects.

The establishment of a permanent Caribbean Climate Change Centre is consistent with the objective of the GEF Secretariat and the development assistance community to integrate adaptation into the development agenda of the SIDS. By establishing the Centre prior to the beginning of the new project IMPACC, the conditions are being created for the region to sustain this effort beyond the project time-frame.

The Next Steps

In an effort to realize this vision, the CARICOM Secretariat, the OAS and the World Bank are actively exploring various avenues for multilateral and bilateral funding. The team is seeking a Project Development Facility Block-B grant from the GEF to assist participating countries in the Caribbean to define priority areas

for future national and regional interventions in assessment of climate change impact, and in policy formulation and implementation of adaptation. The outcome of the PDF-B will be a project proposal for GEF funding on "Implementing Adaptation to Climate Variability and Global Climate Change in the Caribbean" (IMPACC).

Simultaneously, the CARICOM Secretariat is initiating the process of creating a Caribbean Climate Change Centre. This activity is receiving support from UWICED, the OAS and the World Bank, and CPACC/RPIU. The target date for the establishment of the Centre is June 2001.

A proposal to the Canadian Climate Change Development Fund (CCCDF) is being finalized for submission in December 2000. A positive decision on this proposal is expected by the end of the first quarter of 2001, with the start of a three-year project planned for July 2001. This project would be initiated before the end of CPACC, thus providing critical support to the initial start-up of the Caribbean Climate Change Centre, and ensuring continuity between the end of CPACC and the beginning of IMPACC. The CCCDF will fund activities that are complementary to IMPACC, and will concentrate on public education and outreach, integrating climate change in the physical planning process, and formulating and implementing strategies for adaptation to climate change in the water, agriculture and human health sectors.

Annex 3: Meeting on the Centre

Brainstorming on Mainstreaming Climate Change Issues in the Caribbean

During Day 2 of the World Bank Supervision Mission, at the Accra Beach Hotel, participants undertook a strategic approach to the follow-up to the CPACC Project, reviewing and developing strategic approaches to funding opportunities such as the Canadian Climate Change Development Fund, the GEF Block B Grant Proposal as well as other opportunities.

Among the issues discussed, the Mission Team reviewed plans and strategic inputs to the establishment of the Caribbean Climate Change Centre, which is to be the executing agency of the successor project to CPACC. It was decided that the CARICOM Secretariat, with support from the agencies present at the meeting, would proceed with establishment of the Centre as a priority activity without waiting for the PDF. It was also agreed that this would also make the PDF process a lot cleaner given that the Centre has always been an issue that needed to be clearly defined as a mechanism and not as an activity.

Action Plan and Way Forward for CCCC

World Bank Supervision Meeting - Day 2 -Accra Beach Hotel

Activity	Inputs	Responsible	Date
1. Caribbean Climate Change Centre	Public Information	RPIU/CARICOM/UWICED	Dec-00
	Legal Structure Agreement	RPIU/UWICED	Dec-00
	Marketing	RPIU	Jan-01
	Political Endorsement	CARICOM	Feb-01
	Incorporation/Legal Establishment	CCCC	Jul-01

Annex 4: C4 Issues Report

Caribbean Planning for Adaptation to Global Climate Change (CPACC)

POLICY FRAMEWORK FOR INTEGRATED ADAPTATION PLANNING AND MANAGEMENT (COMPONENT 4)

Summary of Comments From In-country Meetings

Integrating Climate Change Adaptation into National Planning

- No consideration had been given to the aspects of climate change and what changes in the legal framework may be required to ensure that adaptation planning forms an integral part of all planning processes.
- Climate change needs to be integrated into all national strategies and plans, and should be integrated into all sector programs. Climate change should not drive sectoral policies and programs but should form an essential part of the planning and implementation process.
- Further work needs to be undertaken on the identification and assessment of risks associated with climate change and the development of sound modelling capabilities as a basis for informed decision making on all planning activities.
- Consideration for climate change impacts and adaptation options should also be incorporated into the programs undertaken by all government departments.
- In some of the small island developing States it is considered that climate change is an “island systems management” problem that affects areas other than the coastal zone. The “whole island as an ecosystem” needs to be the approach adopted in any integrated and holistic process for adaptation planning and management. The major question that needs to be resolved is how, in practical terms, is climate change incorporated into an integrated planning process.
- There is a need to “internalise” climate change into all sectoral planning activities, and technical knowledge on climate change adaptation should be developed within all sectors. Planning for climate change adaptation should also be cross-sectoral and promote a holistic and integrated approach.
- In relation to climate change, it is recognized that the responsibilities of government need to “evolve”, and adaptation to climate change impacts will require considerable institutional strengthening in a variety of government and private sector organizations.
- An urgent requirement is the establishment of a comprehensive land use planning process that integrates climate change into the planning and decision-making processes. Development needs to be planned in a more strategic manner, which takes into consideration the characteristics and limitations imposed by the natural environment. It is considered that the establishment of a comprehensive land-use planning process is the most important management mechanism for ensuring that climate change impacts and appropriate adaptation options are integrated into the planning processes. Active community participation in all land-use planning activities will be an essential requirement if climate change adaptation is to become a reality. There is an urgent need to improve base-line data

in order to establish a comprehensive land-use planning process.

Public Education and Awareness

- There is a need to initiate the “paradigm shift” in the ways government and civil society deals with climate change and adaptation. As part of the sensitisation process, consideration needs to be given to developing promotional materials, which graphically demonstrates the impacts of climate change and the consequential effects on specific groups/sectors.
- It is recognized that policy makers have to be sensitised on the urgent need to develop an integrated approach to climate change adaptation planning and management.
- Obtaining support, consensus and buy-in from the public/private sectors is an essential part of the process to develop and implement the *National Climate Change Adaptation Policy*.
- It is considered that a strong commitment is required from political directorate if the any adaptation policy is to be implemented.
- Public awareness on the need for a strategic approach to climate change will be critical to obtaining the level of political support that is required to effectively implement any adaptation policy.
- It was considered that a readily identifiable image needed to be developed for the climate change public awareness program.
- The public sector will play an important role in the implementation of any *National Climate Change Policy*. It is important to ensure that the insurance/finance sectors, developers, the tourism sector, engineers and other sectors of the private sector actively participate in the formulation and implementation of an appropriate adaptation policy.
- It is important that a clear message be sent to industrialized countries that existing emission cut-backs under the Kyoto Protocol are inadequate to avoid climate change impacts in vulnerable small island States. It is considered that this message should be made clear to visiting tourists from industrialized nations in order that they may put pressure on their own governments to increase greenhouse gas emission reductions.
- It is considered that climate change should be part of the formal school curriculum. An extensive and wide-ranging public education and awareness campaign on climate change needs to be established. Climate change needs to be “packaged” for teachers if it is to be taught in schools, and a curriculum module should be developed.

Upgrading Climate Recording Capabilities

- Recording stations have been established to monitor climatic conditions under the CPACC project, but these are insufficient to adequately monitor weather patterns. It is considered that more stations may be required.
- Sea level rise monitoring stations have been established, but these are insufficient to adequately monitor sea-level patterns. Additionally, there are no wave recorders in many countries to measure sea swells, or wave height/length or wave energy.
- Storm surge modelling needs to be undertaken.
- There is a need to establish a comprehensive weather, solar radiation and wave monitoring capability in some countries, together with a capacity to measure and monitor soil moisture.

- Although a considerable amount of data has been collected, continued problems are being experienced in data management and quality control of data/information. There is a need to obtain climate data management software to improve information management practices, and a program of institutional strengthening on information storage/manage/retrieval /dissemination.

Integrating Climate Change into Water Resource Management

- Although a comprehensive watershed management program has been developed in some countries, there is a need to undertake a comprehensive inventory of all water resources and identify likely impacts arising from climate change.
- In most countries, no systematic water monitoring programs exist which essentially undermines any attempt to accurately assess vulnerability.
- There is a need for an extensive public education campaign to deal with the uncertainty as to what impacts climate change will have on water quality and quantity.
- The impacts of climate change combined with high demand during the tourist season (which coincides with the dry season) may affect the ability of many countries to adequately deal with seasonal high demand for water.
- There is a need to introduce low-flow toilets through economic incentives to hotels and the owners of residential properties that will encourage the installation of water saving equipment. There is an urgent need to conduct further research on the impacts of climate change on the quality and quantity of water resources (surface and underground).
- There is insufficient data available on saltwater intrusion and how existing underground water resources may be affected by climate change.
- The establishment of a comprehensive water resources management regime is a critical requirement, together with the stringent control of water extraction.

Assessing the Impacts of Climate Change on Human Health

- In relation to the impacts from climate change it was considered that impacts upon human settlement, the conservation of drinking water sources, and the protection of human health as the major areas of concern for some countries.
- Climate change is likely to result in increased incidents of vector borne diseases.
- Concern has been expressed about the human health impacts arising from water infrastructure that may be damaged during storms resulting in the contamination of drinking water.
- The more subtle impacts on human health arising from climate change (e.g., increase in rates of asthma) may not be readily discernable by the public, thereby making it difficult to mobilize public support for any policy changes that may be required.
- There is a need to assess the impacts of climate change on human health and identify appropriate intervention options together with the implications on health service delivery. However, before an appropriate health policy can be developed to respond to climate change, there is a need to collect data and information that can serve to justify anticipated policy changes.

Upgrading Coastal Infrastructure

- The vulnerability of coastal areas from storm surges is a concern, and sea-wall instability continues to be a problem in some countries.
- In most instances the entire country is a coastal zone, with a large percentage being within coastal areas that are extremely vulnerable to sea-level rise and damage from storm surges and flooding.
- “Retreat” and redistribution/relocation of settlements are not feasible options.
- Engineered improvements to coastal structures are very costly. An integrated approach to resource management is required to adequately address the impacts of climate change.

Impacts of Climate Change on Biodiversity

- Coral reefs continue to experience bleaching during El Niño Southern Oscillation events. Climate change is likely to result in increased incidents of coral bleaching and fish kills resulting from algae blooms which are caused by high nutrient levels in coastal waters combined with higher water temperatures and a reduction in freshwater infusion because of changes to ocean currents.
- Regional impacts on ecosystems and regional biodiversity resulting from climate change needs to be urgently addressed. It is considered essential that the resilience of natural systems be enhanced. It was considered that regional impacts of climate change on natural systems needs to be further studied, together with the impacts of natural phenomena (e.g., the volcanic eruptions on Montserrat and “Kick’em Jenny”) on climate patterns.
- Further work needs to be undertaken to monitor and understand the impacts of climate change on marine and terrestrial biodiversity.

Integrating Climate Change into Sustainable Forestry Management Practices

- During Hurricane Floyd, extensive damage to forest cover was suffered on some islands with as much as 5 out of every 10 trees being destroyed. Although data on forestry resources has been collected in most countries, there is an urgent need to monitor changes to forest and mangrove areas resulting from climatic events and changes.
- Existing forestry legislation is inadequate to protect and conserve forest cover, and physical planning and development is often undertaken without any value being placed on existing forestry resources.
- Any change in forestry cover or forest biodiversity as a result of climate change will have an impact on all other sectors in the country. Forest resources are very sensitive to changing climate patterns. The removal of indigenous forest species during clearing for human settlement or for agricultural development activities has caused micro-climates in cleared areas. These micro-climates are impacted by changing weather patterns, and it has been found that the introduction of exotic species is necessary to re-forest any such area. The continued introduction of exotic species will seriously impact the biodiversity of forest areas, and could affect the resilience of the country’s forests. Additionally, climate change impacts are likely to affect water catchment areas and the volume or quality of water generated in such areas.
- There is an urgent need to secure the permanent protection of vulnerable forest and mangrove areas.
- An integrated approach to resource management is urgently required.

Assessing the Impacts of Climate Change on the Agricultural Sector

- One of the sectors most vulnerable to climate change impacts is agriculture and food security is one of the most pressing concerns.
- The full extent of the impacts on the agricultural sector have yet to be assessed and quantified. It is anticipated that climate change will impact food production, yield, food security, drought relief programs, and exacerbate other problems associated with the agricultural sector including soil erosion, land degradation and loss of fertility.
- Careful consideration needs to be given to appropriate intervention options since they could have serious impact on the country's ability to comply with environmental standards imposed by receiving markets, and result in trade restrictions or sanction under international trading agreements.
- Food security will become an important issue in responding to climate change impacts, and there is a need to develop seed banks containing seed varieties that are suitable for use in a variety of changing climatic conditions. Integrated pest management options may be frustrated by climate change impacts.
- The cost of irrigation and the impacts of water extraction on water resources could become a significant factor with changing climate patterns.
- The agricultural sector is of considerable importance to many countries, with the result that flooding and saltwater intrusion into fertile lands is seen as one of the most pressing problems caused by climate change. However, it is considered that further work needs to be undertaken to understand the impacts of climate change on the agricultural sector so that appropriate intervention options can be developed.

Establishing the Legal Framework for Adaptation Planning and Management

- It was considered that existing legal framework in many countries is outdated and cannot adequately address climate change impacts or interventions. Existing laws are sectoral in nature and fragmented, and have not been developed with adaptation to climate change as a consideration.
- There are no building codes or engineering standards in many countries. Climate change has obvious implications on the standards to which structures are built, and there is an urgent need to ensure that the regulation of architects and engineers and that the planning and construction of all buildings and structures in vulnerable areas adequately consider the impacts of climate change.
- Enforcement of Building Codes is a problem with the result that some buildings, which cannot sustain hurricane or severe storm conditions, continue to be constructed.
- There has traditionally been considerable "micro-management" by central government, and there is a pressing need to involve local government and city councils in the implementation and enforcement of building codes and in the regulation of physical planning activities.
- No legislation specific to disaster management has been enacted in many countries, although CDERA has prepared "model" legislation that has not yet been adopted. The model OECS Building Code was not developed with climate change in mind and may need to be revised.
- Many laws dealing with natural resources and land use are very old and have not been developed with adaptation to climate change as a consideration.

- Concern has been expressed about the impacts trade agreements may have on any proposed adaptation options, particularly the enforcement of various standards. It is recognized that climate change impacts all sectors and activities, and should be reflected in the negotiation of all multilateral environmental agreements and in negotiations at the World Trade Organization (WTO).

Economic Instruments

- It was considered that work needs to be undertaken on how to value climate change issues and impacts in socio/economic and cultural terms. Such valuation is often a judgement call by countries.

Integrating Climate Change into National Waste Management Programs

- Waste management is a national priority, and there is a need to evaluate the impacts of climate change on all waste management practices, with particular attention on greenhouse gas abatement.

Integrating Climate Change into the Environmental Impact Assessment (EIA) Process

- Only historical data is used for the purposes of conducting environmental impact assessments (EIA's) and the focus is on identifying the impacts of development projects on the environment. No attempt is currently made to look at the impacts of climate or other aspects of the environment on any proposed project.
- In most countries there is no environmental impact assessment process established by law, which is an urgent priority. Additionally, there is an urgent need to ensure that the consideration of climate change impacts constitutes an integral part of any environmental impact assessment process.
- It was considered that the environmental impact assessment process should be more closely tied to the engineering design stage of development planning so that improved design/engineering standards that address concerns about climate change can be fully integrated into project design.

Improved Disaster Preparedness

- Many countries considered that there was a need to strengthen measures relating to disaster preparedness, flood management and flood insurance.
- It is considered that there is a need to look at obtaining the input from the insurance and finance sectors since the matter of re-insurance for severe storm damage needs to be urgently addressed.
- In some countries the National Disaster Management Plan does not take into account climate change impacts, or attempt to identify areas that are vulnerable and which may need special attention under the Plan. At the national level, it is considered essential that a vulnerability assessment be undertaken to identify vulnerable areas so that appropriate response plans can be built in to the National Disaster Management Plan. Additionally, it is critical that institutional strengthening be provided to the National Disaster Management Office in order that effective response can be achieved after severe climate events.

Assessing the Impacts of Climate Change on the Fisheries Sector

- A data base on marine water quality has been developed in most countries, but no attempt has been made to accurately assess and quantify likely impacts on marine resources from climate change.

Annex 5: MOU for Collaborative Management in the Implementation of C5

**Memorandum of Understanding (MOU)
for Collaborative Management in the Implementation of
Component 5 – Monitoring Coral Reefs for Climate Change Impacts,
Caribbean Planning for Adaptation to Global Climate Change (CPACC) Project,
Between the CPACC Project
and the
Centre for Marine Sciences (CMS)
at the Mona Campus
of the
University of the West Indies.**

WHEREAS, the CPACC Project was established in 1997 to support Caribbean countries in preparing to cope with the adverse effects of global climate change, particularly sea-level rise in coastal areas, through vulnerability assessment, adaptation planning, and capacity-building linked to adaptation planning.

WHEREAS, global climate change is a long term phenomenon requiring technical support be provided well beyond the project lifetime.

WHEREAS, the decision by the CARICOM Heads of Government at their meeting in Canouan, St Vincent and the Grenadines in July 2000 to endorse the regional proposal that the CPACC Regional Project Implementation Unit (RPIU) should evolve into a Regional Climate Change Centre, paves the way for CPACC's long term regional involvement in climate change and variability related issues.

WHEREAS, one of the nine CPACC pilot component activities is Component 5 – Monitoring Coral Reefs for Climate Change Impacts.

WHEREAS, Component 5 will eventually be implemented across the Wider Caribbean Region.

WHEREAS, coral reefs are one of three coastal ecosystems that play a strategically important role in the sustainable economic development of the region,

WHEREAS, the Centre for Marine Sciences at the University of the West Indies, Mona, includes in its Mission: *Research, graduate teaching and outreach in the Caribbean marine sciences...*

WHEREAS, the CMS was actively involved in the November 9, 1995 national consultations that lead to Jamaica's selection of CPACC Component 5 from four possible pilot activities.

WHEREAS, the CMS represented Jamaica at the meeting of Component 5 country representatives on October 8, 1997 at the Unit for Sustainable Development & Environment of the Organization of American States, Washington, to plan the implementation of CPACC Component 5.

WHEREAS, the CMS participated in the Technical Workshop for the Implementation of Component 5: Coral Reef Monitoring for Climate Change March 10-12, 1998 in Belize City, Belize, to provide technical guidance in the design of Component 5.

WHEREAS, the CMS provided technical assistance in the training of representatives from Caribbean countries in coral reef in support of Component 5.

WHEREAS, CMS was a founding member of the Caribbean Coastal Marine Productivity Program (CARICOMP), a regional scientific network, which collects baseline data on three important marine ecosystems - coral reefs, sea grass beds and mangrove forests, at 29 sites in 21 countries throughout the Wider Caribbean.

WHEREAS, the CARICOMP Data Management Centre (DMC) is managed by the CMS.

WHEREAS, the CMS has sought to expanding its role as a regional data repository and management centre, embarking on a programme of expansion of its functions to include data from other regional and global marine environment programmes including;

- the Caribbean Planning for Adaptation to Global Climate Change (CPACC) Project, and
- the Global Coral Reef Monitoring Network (GCRMN).

WHEREAS, the expanded role of the CARICOMP Data Centre to manage more than just the CARICOMP data, has been reflected in the change of name to the **Caribbean Coastal Data Centre (CCDC)**.

WHEREAS, the CMS requested, and received from the CPACC Project, financial assistance to support the analysis and management of CPACC Component 5 data by,

- paying the salary of the individual responsible for analyzing Component 5 data
- providing the office equipment and computer hardware and software necessary to process, analyze, manipulate, report and archive Component 5 data

WHEREAS, the CMS has provided supervision, and technical and operational support for, the Component 5 Data Analyst and subsequently Component 5 Coordinator,

WHEREAS, the CPACC Project recognizes the regional benefits that a continued collaborative arrangement with the CMS would provide in the areas of coastal ecosystem monitoring, data management and interpretation and guidance in the areas of coastal ecosystem management and policy development,

WHEREAS, the CPACC Project wishes to formalize the excellent collaborative relationship that has developed between the Project and the CMS over the last three years,

NOW THEREFORE, the parties agree to the following:

Article I.

That the CPACC project and its institutional successors, and the Centre for Marine Sciences will collaborate to ensure the scientifically sound implementation of Component 5 pilot project in Jamaica, the Bahamas and Belize.

That collaboration between the CPACC Project and its successors and the Centre for Marine Sciences will extend to the subsequent expansion of Component 5 to the remaining CPACC countries (Antigua and Barbuda, Barbados, Dominica, Grenada, Guyana, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent, Trinidad and Tobago) and, where possible, to non-CPACC countries.

Specifically, the CMS will facilitate the implementation and subsequent expansion of Component 5 activities through technical support to be provided by the **Caribbean Coastal Data Centre (CCDC)** in the areas of;

- data processing
- data analysis
- data archiving
- technical support and training in the areas of data processing, analysis and archiving

- technical support in the preparation of national, sub-regional and regional coral reef status reports
- participation in, and the provision of technical advice to the CPACC Policy Advisory Committee (PAC)² on matters concerning, programme design, planning, and implementation.

The CPACC Project will continue to pay the salary of the Component 5 Coordinator responsible for processing, analysis, reporting and archiving Component 5 data; and for providing technical guidance to countries and institutions participating in Component 5.

The CPACC Project will assist with the provision of the material resources that the CMS will require to support the regional implementation Component 5.

The CPACC Project will provide a float of Two-thousand United States Dollars (USD 2000) to cover minor operational and administrative costs that will be incurred by the Component 5 Coordinator.

The CMS will arrange for a special account to be established with the Bursary at the Mona Campus of the University of the West Indies, to receive the float.

The CMS will manage this account and make requests for reimbursement under the guidelines established by the CPACC RPIU.

Article II

The Director of the CMS will serve as a member of the CPACC **Policy Advisory Committee** to review progress and recommend scientific and administrative changes in the programme.

The CPACC RPIU with the aide of the Policy Advisory Committee will administer CPACC Component 5 for the benefit of all participating countries and institutions.

The CPACC RPIU will be responsible for arranging for the purchase and distribution of the equipment necessary to record, process and analyses the coral reef monitoring data in a manner consistent with the established protocols.

The CMS CCDC with the assistance of the CPACC RPIU will maintain the CC-Reefs e-group for the dissemination of information on global climate change issues and phenomena as they relate to coral reef monitoring.

² The Project Advisory Committee (PAC) provides policy guidance, review implementation progress and work programs, and evaluates project results. The PAC is comprised of one representative from CARICOM who chairs the PAC; the region's representative from the GEF Council; two representatives of the National Implementation Coordination Units (NICUs); and one representative each from UWICED, the UNEP's Caribbean Environment Programme, the UNDP, and the regional/local NGO community. The Regional Project Implementation Unit (RPIU) acts as technical secretariat to the PAC on behalf of the GS/OAS. A CARICOM representative will serve as the Chairman of this committee, and a UWICED representative will serve as the Deputy Chairman. The PAC meets at least annually, at the invitation of the GS/OAS.

The CPACC RPIU and its successor institutions will be responsible for raising the central funds to support the regional participation of Caribbean Countries and the central administration of the programme.

The initial term of the agreement is three years. The agreement will be reviewed annually at each meeting of the Policy Advisory Committee, or at any time, at the request of either party.

Annex 6: C7 Data Collection

Data Requirement by Pilot Country for Component 7

COUNTRY: ST. LUCIA

Resource/Activity: **Residential and Commercial Properties**

Valuation Method: **Defensive Expenditure Method**

Data Requirement:

- (i) Number of defensive structures in the study area
- (ii) Original cost of construction or reasonable engineering estimates
- (iii) Maintenance/repair costs
- (iv) Life span of defensive structures
- (v) Value of the property protected
- (vi) Purpose of the structure
- (vii) Recorded evidence of effectiveness (such as in a hurricane or storm condition)

Resource/Activity: **Fisheries**

Valuation Method: **Change in Productivity Method**

Data Requirement:

- (i) Catch/effort
- (ii) Size of the fishing fleet (including the # of fishermen)
- (iii) Cost of fishing (wages and fuel costs)
- (iv) Prices of fish by species (ex-vessel)
- (v) Species composition of catch
- (vi) Type of fishing gear
- (vii) Boat capacity and type
- (viii) Area of wetlands
- (ix) Water quality

Note: Time series data on above variables as far back as possible would be useful.

Resource/Activity: **Residential Beach Use**

Valuation Method: **Random Utility Model**

Data Requirement: Information necessary of this valuation exercise will be collected through primary data.

Resource/Activity: **Visitor (Stay-over and Cruiseship) Beach Use**

Valuation Method: ?

Data Requirement: For these activities secondary data collected by the St. Lucia Tourism Board will be used.

COUNTRY: DOMINICA

Resource/Activity: **Residential and Commercial Properties**

Valuation Method: **Hedonic Model**

Data Requirement:

- (i) Length of beach front
- (ii) Vulnerability to erosion (historical erosion rates and/or some index of susceptibility to erosion)