

Caribbean: Planning for Adaptation to Global Climate Change (CPACC)

The Draft Proceedings

of the

**Regional Training Workshop on Methodologies
for Coastal Inventories & Information
Management.**

March 18 -20, 1998

Accra, Barbados

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Introduction:

The CPACC Project – An Overview.

The CPACC project was designed to support the participating Caribbean countries in preparing to cope with the adverse effects of global climate change, particularly sea level rise in coastal and marine areas. This is to be achieved through vulnerability assessment, adaptation planning and capacity building linked to adaptation planning. The Project is being executed through the cooperative effort of CARICOM member states and participating institutions over a period of four years (starting April 1997) by a combination of national pilot/demonstration components and regional components. The project is financed by a Global Environmental Facility (GEF) Trust Fund grant through the World Bank as one of its implementing agencies and executed by the Organization of American States (OAS). A Regional Project Implementation Unit (RPIU) has been established within the institution of the University of the West Indies Center for Environment and Development (UWICED). The RPIU is located in the CERMES Building at the UWI Cave Hill Campus, Barbados. The Unit was established to *ensure the effective coordination and management of project activities at the regional level*. CPACC participating countries include Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Saint Lucia, Saint Kitts and Nevis, Trinidad and Tobago, and St. Vincent and the Grenadines.

The Project will adopt a regional approach to achieve its objectives; to

- 1) Strengthen the regional capability for monitoring and analyzing climate and sea level dynamics and trends, seeking to determine the immediate and potential impacts of global climate change (GCC);
- 2) Identify areas particularly vulnerable to the adverse effects of climate change and sea level rise;
- 3) Develop an integrated planning and management framework for cost effective response and adaptation to the impacts of GCC on coastal and marine areas;
- 4) Enhance regional and national capabilities for preparing for the advent of GCC through institutional strengthening and human resource development;
- 5) Identify and assess policy options and instruments that may help initiate the implementation of a long-term program of adaptation to GCC in vulnerable coastal areas.

Component 3¹: Inventory of Coastal Resources and Uses.

The **overall objective** of Component 3 (C3) is to;

1. assist participating CPACC countries to further develop their respective inventories of coastal resources and uses, and
2. provide the necessary base-line data for the execution of other project components.

The specific **objectives of Component 3** are as follows:

1. To collect the base line information for a coastal inventory that is required by each country to effectively conduct their pilot project activities
2. To establish a data base incorporating existing information, the results of surveys and the analysis of remote sensing information into GIS
3. To further in country institutional capacity for the collection and storage of coastal inventories; and
4. To ensure that the database is stored within one responsible institution in each country.

The Regional Training Workshop on Methodologies for Coastal Inventory & Information Management

The first Regional Workshop on the Establishment of Inventories of Coastal Resources and Uses, was held at the Accra Beach Hotel over three days, from May 18 to 20, 1998. A total of twenty-four participants from twelve countries (Appendix II) attended the Regional Workshop.

The original CPACC Project document envisaged a regional training course in resource inventory preparation, for technical resource representatives from the 12 participating countries.

Planning for this workshop was initiated at a meeting at the OAS Headquarters, Washington, USA, on February 3 1998. Participating in the meeting were;

¹ The other CPACC project components are;

- **Component 1:** Design and Establishment of Sea Level/Climate Monitoring Network
- **Component 2:** Establishments of Data Bases and Information Systems
- **Component 4:** Formulation of a Policy Framework for Integrated Coastal and marine management
- **Component 5:** Coral Reef Monitoring for Climate Change
- **Component 6:** Coastal Vulnerability **Component** and Risk Assessment
- **Component 7:** Economic Valuation of Coastal and Marine resources
- **Component 8:** Formulation of Economic and Regulatory Proposals.

Leslie Waling and Ian King (CPACC Regional Project Implementation Unit), Jan Vermerin and Claudio Volonte (General Secretariate of the OAS). The purpose of the meeting was to identify and discuss the methodological and technical issues critical to the successful implementation of Component 3 in preparation for a subsequent meeting with representatives from the National Oceanographic and Aeronautical Administration (NOAA).

The RPIU/OAS team met with representatives from NOAA on February 4 1998. Issues affecting the design and implementation of an inventory of coastal resources, uses and users, and the types of technical capacity and expertise that NOAA had developed in this area were discussed.

Arising from the meetings a consensus was developed as to the critical issues that should drive the planning and implementation process (Appendix I). The main areas of agreement were that;

- i. The implementation of C3 should be a process rather than a series of scheduled events.
- ii. the implementation process should be client driven
- iii. coastal resource and use inventories should be developed around country needs
- iv. the implementation process must build capacity across the continuum of experiences in the region.
- v. Non-governmental organizations (NGO's) should participate in the planning and implementation of C3, particularly in the supporting public awareness activities
- vi. the uses of information generated by the inventory of coastal resources and uses, must be clearly defined during the design phase of the inventory
- vii. the C3 implementation process must bring professionals and practitioners in the region together, to work and share experiences, thereby developing an infrastructure of talent across the region.

Workshop Objectives

- i. To assist participating countries in the implementation of an inventory of coastal resources and uses by:
 - exposing participants to the critical issues that affect the quality and utility of coastal resource inventories;
 - sharing regional experiences and expertise in the conduct of coastal resource inventories;
 - identifying the national priorities to be considered in the planning of coastal resource inventories; and
 - introducing participants to information management tools and issues.
- ii. To develop consensus on a methodological approach for inventories in participating countries.

Workshop outputs

The outputs from the workshop included;

- The methodological approach for implementing a low resolution national inventory of coastal resources and uses that takes into consideration,
 - The goal and purpose of their inventory.
 - Important issues that affect the planning and design phase of the inventory.
 - The data requirements of the inventory.
 - Existing sources of data for the inventory.
 - Access to data for the inventory.
 - The types of data that are considered to be of high national priority.
 - The types of data that will actually be collected.
 - The current or anticipated use of the collected data.
 - Resources needed to collect new data.
 - Constraints and challenges foreseen.
- An implementation action plan and time-line for a low-resolution national inventory of coastal resources and uses for each participating country.

- Workshop proceedings that provide a documentary record of the process used to decide on the methodology or methodologies for conducting national inventories and the issues, concerns, constraints and priorities that informed the decision making process.

Summary Proceedings Of The Sub-Regional Workshop

Opening Ceremony

The Workshop was opened by Dr. Trotz, Director of the Caribbean Planning for Adaptation to Global Climate Change (CPACC) Project. The welcome was given by Mr. Leslie Walling, Coastal Zone Management Specialist, CPACC (Appendix III). The Honorable Gline Clarke, Permanent Secretary (Environment) Ministry of Health and Environment made the opening address (Appendix IV). An overview of the CPACC Project and Component 5 was given by Leslie Walling (Appendix V).

Workshop Presentations

Conducting an Inventory of Coastal Resources and Uses: Critical Considerations

Presented by Dr. Leonard Nurse (Appendix VII).

The presentation by Dr. Nurse high-lighted a number of important issues;

- An inventory of coastal resources is of no practical use without information on the associated uses of these resources.
- Both resource managers and resource users are operating in an environment of scarce resources.
- Recognizing the importance of resource utility component of the resource inventory process provides the resource manager or policy maker with a potential strategic benefit. Short term pay-offs to that can be parlayed into linkages and alliances with the private sector users.
- Examination of the use component of inventories might assist in identifying those "short term pay-offs" that justify investments in coastal resource inventories, and that may also help to establish linkages and alliances with private sector interests².

²A similar situation has arisen in the CPACC Coral Reef Monitoring for Climate Change Component. The governments of Belize, The Bahamas and Jamaica have been asked to assist in the implementation of this project. Any substantial information indicating climate change related impacts to coral reefs will be accumulated over the medium to long term, i.e. over the decades of time. However, the coral community base-line data that will be collected is of immediate value to marine protected area managers, institutions involved in coral reef research, dive operators and national coastal resource management authorities. Private sector interests, institutions and environmental non-governmental organizations have volunteered logistic support in exchange for base line information and or trend analysis information.

- Each country has more data than resource managers and policy makers think we have. The challenge is to develop a strategy for finding the data and to establish reliable archival sources³

³The first major activity in the Inventory of Coastal Resources and Uses Component is the cataloguing of existing information on coastal resources and uses. This base line will provide material for the digitized coastal resource inventory that will be prepared for each country and identify the information gaps.

Building a Coastal Resource Inventory: The NOAA Experience. Data and information tools and technology, and scales of application.

Presented by S. Paul. Orlando Jr. (Appendix VIII)

The presenter reviewed the types of decisions that were made in designing an inventory of coastal resources and uses. He went on to discuss coastal issues that affected the quality of coastal ecosystems and the associated impacts. The associated impacts were discussed in terms of their respective spatial scales of influence and the implications of considerations of scale for data management. Prominent issues in the design and development of an inventory were identified and prioritized. The consultant closed by emphasizing that the implementation of a coastal resource inventory was a **process** not a **project**, as the project driven approach could only be depended on to provide **short term pay-offs**.

Applications of GIS in Coastal Resource Management: Database design and management issues.

Presented by Dr. Jacob Opedayi

In his presentation, Dr. Opedayi highlighted a number of important issues;

- In the Caribbean context, the "corporate view" of coastal resource inventory data implies regional ownership. What will prove to be good for everyone over the long term, may not necessarily be the same as what is needed to satisfy our immediate coastal resource information needs.
- We can not have a corporate view without GIS. GIS provides an integrated view across disciplines and formats. Spatial integration is the biggest challenge to the development of an integrated view. GIS has dealt with this challenge⁴.
- We can not have a corporate view without a workshop like this. There is a need to develop a popular consensus on a *single database for the whole Caribbean*. There is a need to ensure that when we talk refer to a particular data item, it means the same thing to everyone.
- While GIS presents stationary data, coastal resources data are always dynamic. No GIS software can handle this.
- With regards to the **data collection strategy** and data entry for the GIS inventory the issues of who collects the data and the means of collection

⁴ IOC (1994) GIS constitutes a powerful management tool as it is a computer-based system integrating as much information as possible on a given area, including scientific, social, cultural, and economic data, to assist decision-makers in managing their coastal zone in a proactive fashion. It allows a concise view of an often complex situation, and can be applied to most areas of relevance to sustainable development.

(IOC Workshop Report No. 103. IOC Workshop on GIS Applications in the CZM of SIDS. 1994.)

(remote sensing, field visits, GPS) are more important than the data themselves.

- The need for an **evaluation of future data usage and needs requirements at the start of the GIS inventory development process** should not be taken lightly. This is an integral part of the of the inventory development process. It is important to determine if the information that is to be collected will meet the stated needs and requirements of the end users. If the data being collected will not meet the expected applications the data collection strategy needs to be changed.
- The creation and maintenance of metadata serves the purpose of highlighting the existence and location of data or conversely, data gaps.
- In the process of designing the database for the GIS inventory of coastal resources answers must be found to questions such as
 - The type of data storage medium to us
 - The size of the data base, which bares a direct relationship to the cost of the database
 - The age of the data, older data being better because it lends itself to trend analysis, while new data lends itself to status analysis
 - The scale at which partitioning will be established e.g. at the island, watershed or map sheet level. **This is an issue the needs to be standardized for this project**
 - Questions of security arise when considering the issues of who should be able to redefine the data schema, standards and formatting.
- The development of a database to support a coastal resource inventory represents a business potential based on the existence of a repository rich in data. This in tern presents the opportunity for cost. These potentials introduce the issues of confidentiality and the security of data.
- The presenter identified a number of requirements for a successful and policy-effective inventory of coastal resources and uses. These included,
 - High standards of data quality
 - Cost containment
 - Meeting schedules
 - Adequate staffing
 - Database maintenance
 - Satisfied users
 - Upper management support, and
 - Procedural innovation i.e. procedures that do things the way they **should be done** and not the way things are done now.
- The presenter closed by emphasizing the importance of ensuring that implementation is **process driven** rather than **project driven**.

Country Presentations

Brief presentations were made on the state of inventories of coastal resources and uses in each country. The countries and presenters are listed below.

- | | |
|-------------------------|-----------------------|
| 1. Antigua and Barbuda | Mr. Philmore James |
| 2. Barbados | Mr. L. Brewster |
| 3. The Bahamas | Ms. C. Albury |
| 4. Belize | Mr. H. Matus |
| 5. Dominica | Mr. R. Sabastien |
| 6. Grenada | Mr. Mr. L. Taylor |
| 7. Guyana | Mr. Shiek Kahn |
| 8. Jamaica | Mr. Krishna Desai |
| 9. St. Kitts and Nevis | Mr. Mr. E. Daniel |
| 10. St. Lucia | Ms. E. Charles-Soomer |
| 11. St. Vincent | Dr. R. Murray |
| 12. Trinidad and Tobago | Mr. M. Datadeen |

The full text of these presentations can be found in appendixes X to XIX.

Break out groups

The workshop participants formed into three break-out groups to discuss the coastal resource inventory process as it related to three of the four pilot activities,

- Component 5: the monitoring of Coral reefs for climate change impacts,
- Component 6: coastal vulnerability and risk assessment, and
- Component 7: The Economic Valuation of Coastal Resources
-

The purpose of the exercise was to provide the participants with an opportunity to think through the implementation process for one of the pilot projects applying some of the concepts relating to GIS that they had been exposed to during the workshop. It also provided the participants with an opportunity to interact at a professional level and share experiences and views. In this way it was anticipated that a consensus would be developed on the approaches to be adopted for the implementation of the pilot projects. The break out sessions were not intended to produce plans for implementation or to define implementation processes.

The three break out groups used six basic questions to guide their deliberations,

1. What do you want to do
2. Why do you want to take these actions
3. How do you plan to implement these actions
4. What resources will be needed (priority)
5. What role will GIS play in this process
6. How will GIS

Monitoring Coral Reefs for Climate Change Impacts

1. What do you want to do

The coral reef monitoring group planned to monitor coral reefs to establish baseline data on coral reef health. Coral reef health was considered to be directly related to the ecological and economic benefits that coral reefs provide.

2. Why do you want to take these actions

The justification for monitoring coral reefs was that they would serve as biological indicators of sea level rise.

3. How do you plan to implement these actions

The breakout group decided to adopt either the CARICOMP or AGRA method for monitoring coral reefs. The adoption of the CARICOMP method was considered to be a strategically advantageous approach to implementation as the CARICOMP project had already accumulated ten years worth of coral reef monitoring data for some Caribbean locations. It would also permit Component 5 participants to utilize the existing human and technical resources in the CARICOMP network.

4. What resources will be needed (priority)

The coral reef data would be collected along transect lines using a video camera to record the information. Frames would be captured from the video footage and geo-referenced for integration into a GIS inventory system. The geo-referenced coral reef data would be supplemented with data on water quality.

5. What role will GIS play in this process

GIS was seen as a tool that would permit the areas under investigation to be mapped, and overlays of the different resource use patterns to be developed to produce a better spatial sense of the interaction of the various factors that affect coral reef health.

A coastal resource inventory was considered to be a necessary pre-requisite to effective planning in the coastal zone. By extension, it was considered advantageous to have spatially referenced coastal resource data before embarking on detection exercises.

GIS was as considered to be an important tool for trend analysis, as it would permit resource managers to look at possible contributors to coral reef degradation if geo-referenced.

7. How will GIS help you to design and support your response to sea-level rise.

GIS will assist in the identification of

- coral reef areas of importance that need management attention,
- what is affecting specific areas of coral,
- vulnerable areas,
- data gaps and the need for new data
- problems in acquiring existing data and incorporating them into a coastal resource inventory.

The questions were raised,

- will we be able to detect sea-level rise trends over the region using the coral reef monitoring sites that will be established in The Bahamas, Belize and Jamaica?
- will the data generated by coral reef monitoring methodology be able to differentiate between trends in coral reef community composition and or health that result from sea-level rise, and other causes of coral reef degradation?

Dr. Nurse noted that the Component 5 monitoring programme would be designed to answer specific questions and as a result care must be taken to ensure that these issues are addressed. He went on to point out that this type of investigation required a relatively long data set to establish trends and links to impacts. At least

ten years worth of data would have to be accumulated. In the absence of the long data sets predictions would be dependent on the use of models e.g. the General Circulation Model.

Coastal Vulnerability and risk Assessment

1. What do you want to do

- Acquire information on what resources exist in the coastal zone,
- Assess the level of vulnerability
- implement a monitoring programme
- Involve public, stake holders, to make an input, to develop desired goals.

2. Why do you want to take these actions

Sixty percent or more of the world's population lives in coastal areas. A significant proportion of the economic activity, physical infrastructure, institutional resources and population in each CARICOM country are located within this zone. To a greater extent the fate of foreign exchange earnings economic life of CARICOM countries is bound up in the fate of the coastal zone. .

3. How do you plan to implement these actions

- assemble data in archive, institution that is available.
- ID Gaps.
- Determine level of resilience of system, the robustness to withstand sl rise, and other assoc sl rise factors.

4. What role will GIS play in this process

GIS will, serve as a planning tool, assist with information gathering, data analysis and dissemination. As a tool GIS will accommodate a range of information sources for spatially referenced data, spacial references.

5. How will GIS Assist in designing and supporting your response to sea-level rise.

- GIS will facilitate the evaluation of trends and references,
- Influence planners by producing comprehensive summary presentations of spatially referenced information.
- GIS based resource inventory will link disparate records, increasing the utility and reducing the duplication of records.
- Will promote the systematic collection of data.

One view expressed in the discussions was that a major challenge that will be faced, is the development of a legal mechanism that will allow GIS/Inventory

practitioners in each territory or in the region, to work without influence from private interests that might wish to influence the interpretation of the data.

It was agreed that a common regional approach would be necessary to establish the necessary legal framework, financial and training arrangements that must be in place before GIS based coastal resource inventories can be utilized effectively.

Another set of challenges that were identified were those associated with difficulties in gaining access to existing data and the establishment of collaborative arrangements for data sharing. It was noted that problems of this nature are experienced between government agencies within the same country. A GIS based inventory of coastal resources will be dependent on institutionalized arrangements for data sharing and collaboration. A critical step to the development of national GIS based inventories of coastal resources and uses will involve identifying and rectifying the obstructions to data access and sharing.

Tanya Harris identified herself as one of two physical planners at the workshop. Inventory. She went on to say that she worked in the Town Planning Department where GIS technology had recently been introduced. Despite the newness of the technology GIS was instrumental in the legality of planning. She noted that GIS helped the TPD to gain a more comprehensive view of land use planning issues. The decisions that were made with the aide of ZGIS became land use policy is. She concluded that it was the physical planners that were the ones formulating development planning policy. Ms. Harris felt that GIS as a tool had played an important role in getting the physical planning practitioner to this point. She felt that GIS would also play an important part in development of an inventory of coastal resources and uses.

Economic Valuation

1. What do you want to do

The group started by noting that many natural resources in the coastal zone had values that were intangible, and that the discipline that might attribute value, resource economics, was not an exact science.

2. Why do you want to take these actions

Sea level rise will have a number of impacts that will affect both natural and manmade. In order to plan for the affects of sea level rise on manmade and natural resources we need to monitor resource conditions. The monitoring process should start with the development of an inventory of coastal resources and uses.

3. What resources will be needed

- A practical definition of the “coastal zone”. In Dominica the island is defined as the coastal zone. In Barbados the working definition of the

coastal zone has been the first road from the shore line. In other territories the coastal zone has been defined with reference to an elevation contour or a specified distance from the high-water-mark.

- List all infrastructural resources e.g. roads, buildings, jetties, piers, drainage structures etc.
- A catalogue of the functional uses of the natural resources as a means of valuating the resources.
- Information on the functions and uses as a mean of valuing coastal resources.
- Criteria for prioritizing the importance of resources, to provide guidance for the collection of information for the resource valuation process .
- A technique or techniques for valuation that are broadly acceptable to the resource managers and decision makers.
- An evaluation of existing data with a view of identifying data gaps in both primary and secondary information.

4. How will GIS help you to design and support your response to sea level rise.

- GIS will be used to pool data sets into a system that supports efficient and rapid storage, retrieval and manipulation of data. Such a system would address the need to understand where there is a pressure or depletion of a resource.
- GIS will act as a policy tool facilitating the analysis of the impacts of certain policy decisions relating to direct and indirect resource use.
- GIS will provide the means to;
 - evaluate and monitor coastal resource loss,
 - define temporal or three dimension limitations,
 - perform trend analysis by quantifying the differences between data sets,
 - provide a basis for resource valuation and planning,
 - provides a sound quantifiable basis for developing policies and plans for sustainable resource use and conservation.

In the discussions that followed the presentation of the break out groups;

- Leslie Walling suggested that the implementation process for Component 3 might have to define the coastal zone on the basis of the issues that each participating country considers to be of national priority.
- Dr. Renold Murray felt that natural resources could be easily valued with current methods. His concern was that when a price was put on a resource there was no definable mechanism for translating that value into a status of priority.

- There was a general feeling among participants that there was a need to be appraised of the techniques available for resource valuation, and their relative merit.
- Dr. Leonard Nurse was prompted to respond quickly to Dr. Murray's point. Dr. Nurse felt that the valuation of a particular resource could be viewed from at least two perspectives, i.e. that of the direct economic benefit and that of the economic cost of replacement. On one level, **the direct economic benefits** contributed by natural resources to tourism or the marketing of fish landings are easy to demonstrate and are easy to understand. At another level we can examine the **economic cost of replacing** the functions that would occur if specific coastal resources were lost e.g. the loss of a coral reef and its replacement with a break water or artificial reef. These man-made structures must be designed, modeled, constructed and maintained. In addition to the expenditure incurred to replace the coral reef, only one function (break water) is replaced, and not even fully. A reef is a self-maintaining, growing structure under normal conditions. In the final analysis the country loses money from the loss of a reef to the value of the loss of the natural reef functions.
- Dr. Nurse noted that all three presentations contained cross-cutting issues such as integration, storage and manipulation of data that are of critical importance whether the focus of investigation is coral reef resources, coastal vulnerability or the economic valuation of coastal resources. Another cross-cutting issue was that of the identification of data gaps.
- An important issue for consideration in the development of inventories of coastal resources, was that of the use of tools and data for modelling, and examining development options. GIS was considered to be precisely suited for this type of "what if" assessment application. The example of traditional tourism was used in which models could be used to test the outcomes and impact scenarios, for changes in such variables as
 - reduced arrivals,
 - changes in the numbers of scuba divers visiting specific areas of coral reef, and
 - the replacement of high impact tourism with low impact alternatives.

In this respect, GIS could be used to identify hot-spots e.g. those reefs most at risk from concentrations of boats and yachts that present the risk of anchor damage.