

EXECUTIVE SUMMARY

This final assessment of the Global Environmental Facility (GEF) offers two types of evaluation. Section 3 is a performance evaluation. This assesses the accomplishments of the project as they were foreseen in the Project Document negotiated in 1993. Sections 4 and 5 are a management capacity assessment. They assess the defining features of coastal management initiatives as they have been described by The Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP 1996). Management capacity assessments are conducted to determine the adequacy of management structures and governance processes as these relate to generally accepted international standards and experience (Olsen, et al. 1997). The major conclusions that emerge from both forms of evaluation may be summarized as follows:

- The project has met or exceeded the six objectives, 13 outputs and 59 activities specified by the Project Document. Substantial progress has been made in achieving the integration between science, planning and public policy formulation called for by the project's development objective.
- The project also has produced significant benefits not contemplated by the Project Document. These include the development of new university programs in landscape architecture and resource economics. Twelve Master's degree theses, six Ph.D. theses and four senior projects in architecture all have addressed topics of direct relevance to the project.
- The Government of Cuba's in-kind financial contribution to the execution of the project increased from US\$4 million to an estimated US\$9 million.
- A comprehensive strategic plan for the Sabana-Camaguey (S-C) region has proceeded through two major revisions. The most recent draft (September 1997) identifies the major issues affecting the prospects for sustainable development and biodiversity conservation and the actions and policy reforms required for its successful implementation.
- A large effort has been made to generate baselines that document the very high biodiversity and endemic qualities of the S-C region. These baselines provide a basis against which to gauge future ecosystem change.
- The project office in Havana, the Cayo Coco Ecosystem Research Center and satellite provincial facilities in the five provinces of the region have been equipped with geographic information systems (GIS) and the equipment required to further document and analyze both the biodiversity of the region and human-related threats to the qualities of this ecosystem.
- An ambitious set of national parks and reserves, and fisheries sanctuaries have been proposed and submitted for formal adoption by the relevant governmental institutions.

- The project team achieved an unusual degree of inter-institutional collaboration and produced the integration and consensus among the scientific community and development interests that were major goals of the project. The goals of the program, and a concerted effort to define practical means to achieve sustainable forms of development and biodiversity conservation, are understood and supported by all major stakeholders.
- A major strength of the project is that it applied the strategic planning process and emerging development guidelines to the ongoing tourism development process. These tangible applications of elements of the strategy have had a significant impact on development, and have corrected such past mistakes as the berm road across Bahia de los Perros.
- Cross-sectoral and cross-disciplinary technical capabilities have been strengthened. Regional experience in tourism development and biodiversity conservation has been brought to Cuba and is positively impacting the formulation of good practice in the archipelago.
- An effective public education program has been mounted. Public awareness of the values of the S-C ecosystem and threats to its environmental qualities appears to have been achieved.
- An institutional framework, featuring an interprovincial commission, a network of parks and preserves, and a decentralized monitoring system has been designed. Several important elements of this management strategy are in the formal approval process.
- The project is at the threshold of formal approval and funding of some elements of a comprehensive management strategy (Step 3) According to the steps of the coastal management policy process outlined by GESAMP (1996). This places the project's initiative at or ahead of the status implied by the End of Project Status described in the Project Document.
- The substantial progress made during the GEF project will produce significant benefits in biodiversity conservation and sustainable forms of tourism development if the effort continues into an initial phase of implementation. Continued GEF support appears both necessary and justifiable to sustain the momentum. An implementation phase should pay greater attention to the contributions of the S-C ecosystem, to the conservation of biodiversity, and to testing new approaches to tourism development in the Caribbean region.

1. INTRODUCTION

1.1 Project Overview

Country:	Cuba
Project Number and Title:	CUB/92/G31
Duration:	Three years
Executing Agency:	United Nations Development Program
Implementing Agency:	Academy of Sciences of Cuba
(1994)	Ministry of Science, Technology and Environment (1995-present)
UNDP Contribution:	US\$2 million
Government of Cuba Contribution:	US\$4 million (increased to 9 million)

This project was designed in 1993 as the first phase of a three-phase project that would total \$10 million over 10 years. The lead agency responsible for the execution of the project changed in 1995 to the Ministry of Science, Technology and the Environment. The senior technical advisor to the project was Mr. James Dobbin.

The project addresses conservation and development needs in the watersheds, the archipelago and the exclusive economic zone of the north central coast of Cuba. This area, known as the Sabana-Camaguey (S-C) ecosystem, includes five provinces and a total area of 75,000 square kilometers of land and sea that includes 2,517 cays. This ecosystem contains some of Cuba's most beautiful, biologically diverse and historically rich regions. The region is considered to possess a very high potential as a destination for international tourism. Petroleum exploration and development are taking place in the western part of the archipelago. Expanded industrial and agricultural development are also planned for the mainland. The project was designed to protect the rich biodiversity of this region and to promote an approach to tourism development that would follow the principles of sustainable forms of development as set forth in Agenda 21 of the 1992 United Nations Conference on the Environment and Development (UNCED).

The government of Cuba allocated 79 million Cuban pesos to infrastructure development, planning and research in the S-C ecosystem before the GEF project was initiated. The contributions of the government of Cuba to project implementation are estimated by the project's accounts to total US\$9 million (at an exchange rate of US\$1 to 1 Cuban peso). The UNDP budget of \$2 million was allocated and expended as follows:

Categories	As Allocated (%)	As Spent (%)
Equipment	54	64
Miscellaneous	2	1
UNDP Costs	7	8
Meetings and Events	3	2
Subcontracts to Nationals	2	1

External Consultancies	21	16
Scholarships	4	5
Missions	4	1
Study Tours	3	2

1.2 Evaluation Methodology

This final evaluation was led by Stephen Olsen, director of the University of Rhode Island's Coastal Resources Center (CRC). The other members of the team were:

Michael Smith, director, Caribbean Biodiversity Program, Center for Marine Conservation

Jose Ottenwalder, director, UNDP-GEF Coastal Marine Biodiversity Project, Dominican Republic

Ana Maria Suarez, Centro de Investigaciones Marinas, Universidad de la Habana

Section 3 of this report is a performance evaluation, following the Terms of Reference, that assesses the progress made towards the project's objectives and intended outputs as they were defined by the 1993 Project Document. Sections 4 and 5 of this report are management capacity assessments that address the topics suggested by GESAMP (1996) for the steps of issue definition and program preparation in the integrated coastal management (ICM) policy cycle. These sections draw upon the worksheets developed by CRC that were first tested in January 1997 in the final evaluation of the GEF Patagonia Project.

The evaluation team worked together in Cuba from June 9-13. June 12 was spent at the field site viewing tourism facilities in the vicinity of Cayo Coco and at the Ecosystem Research Center. The schedule for the site visit and the principal people contacted are given in Appendix B. On Friday, June 13, the evaluation team developed the major conclusions and recommendations of this evaluation at an internal working session at the offices of UNDP. These were reviewed orally with the UNDP resident representative and staff and subsequently with the GEF project staff and vice-minister of Science, Technology and the Environment. These findings and recommendations were distributed as a memo on June 17. A draft of the Evaluation Report was distributed to all members of the team on July 16, and a draft containing the comments received from the team members was sent to UNDP/New York, UNDP/Cuba, the project director, and the permanent advisor to the project on August 14. Final adjustments to this document were made by the chief-of-party on a second visit to Cuba, September 14-18, 1997.

1.3 The Cuban Context

Cuba is unique among the nations of Latin America and the Caribbean, and provides an unusual social and institutional context for an ICM program. As a socialist nation, the usual tensions between the public and private sector are absent or less intense than in other nations in the region. The implementation of public policy is more readily achieved. The limited technical capabilities and pervasive corruption that characterize government agencies in many countries in the region are not defining characteristics of the public sector in Cuba. Following UNCED, the government of Cuba has made a

major commitment to reforming its policies and restructuring governmental institutions to follow the recommendations of Agenda 21. This has created a positive context for this GEF ecosystem management initiative and has provided the project with a remarkable degree of governmental support. Finally, the technical excellence of Cuba's scientific community is well known. This GEF project has engaged a large proportion of Cuba's marine scientists and their dedication and competence has shaped its accomplishments.

2. ANALYSIS OF THE PROJECT DESIGN

2.1 Scope and Objectives of the Project

The brief description in the cover sheet of the Project Document defines the objective of the project as: “[providing] a scientific basis for integrated sustainable development and environmental conservation” in the S-C ecosystem. This would be achieved by:

- Equipping the coastal ecosystem research center and thereby initiating ecosystem monitoring and biodiversity research
- Establishing stronger functional links between the sciences and development interests
- Developing a regional strategic plan for tourism and other activities within the context of environmentally sound management

The development objective calls for the integration of:

- Biodiversity conservation
- EEZ planning and management
- Watershed planning and management
- Small island planning and management
- Tourism and ecotourism
- Innovative approaches to resort development

The Project design calls for a total of 13 Activities and 59 Outputs organized around six intermediate objectives. These are:

- Strengthen the technical capabilities of the Ministry of Science, Technology and the Environment and other agencies to survey and assess coastal and marine ecosystems in support of biodiversity conservation and sustainable development. This element calls for large investments in equipment and some training.
- Strengthen the scientific and environmental planning and management capabilities of Cuban agencies at the national, regional and local levels. This element features training activities and an operational GIS system.
- Develop scientific information for resource management and sustainable development. This element includes numerous inventories, surveys and mapping activities designed to generate baselines for a permanent monitoring program linked into the GIS.
- Develop a strategic plan for the S-C ecosystem that fully integrates tourism and other economic activities with biodiversity protection to achieve sustainable development.

This element calls for prioritizing biodiversity resources and habitats, identifying activities of particular concern, and developing management plans for priority sites. These conservation activities are to be balanced with (1) a strategic plan for tourism and development activities and (2) a strategic plan for the S-C ecosystem to be developed through interagency working sessions.

- Establish a framework and initiate a public awareness program featuring the flora and fauna of S-C ecosystem and approaches to sustainable development. This element includes museum and interpretive center exhibits, as well as radio, film and newspaper programs.
- Compile, organize and analyze existing climatic data and information pertinent to long-term management (i.e., on global warming, climate change, international waters and oil spill response). The two activities identified for this component address the measurement and presentation of climatic information.

The project design is cumbersome and lacks a structure that promotes a logical sequencing of objectives and actions. Rather than presenting a coherent planning and policymaking process, the Project Document contains long lists of items grouped by broad categories. The Project Summary, the development objective, the intermediate objectives and the Expected End of Project Status all present similar ideas in somewhat different terms. In some cases, results in the End of Project Status are not provided for in the lists under the relevant intermediate objective.

2.2 The Planning Process

The 1993 Project Document describes a process of “Strategic Planning for Tourism Development” that provides a conceptual framework for the project’s activities. This emphasizes the importance of involving in the planning process those who will be responsible for implementing the strategy. Thus, the steering committee responsible for the execution of the project contains both representatives of the scientific community and those responsible for tourism development in the archipelago. The integration of science and management is designed to occur through a sequence of activities outlined under intermediate objective 4. First, the environmental features of the area are mapped and assigned to one of three categories: environmentally-sensitive areas, areas recommended for preservation in their natural state and areas in which development can be accommodated. The second phase, “Output 2: Strategic Plan for Tourism Development Activities,” calls for an analysis of tourism development options and the preparation of specific strategies for the development of new products, marketing initiatives, etc. The final phase (Output 3) integrates the conclusions of the first two steps into an “Ecosystem Strategic Plan” prepared through a series of site planning workshops and interagency working sessions. The major products expected from this process are:

- A comprehensive strategic plan
- Environmental planning and development guidelines
- A list of priorities for implementation

As described in Figure 7 of the Project Document, the strategic planning process includes the formulation of detailed implementation plans for selected areas of the archipelago. This implies that some experience in the application of the planning approach to selected sites in the archipelago would occur during the GEF project. The implementation of such site-specific development plans would specifically include gaining formal approval and ensuring that the required financial resources are obtained. Such experience in the implementation and testing of the strategic planning process was seen as vital to strengthening the capabilities of the steering committee.

2.3 Project Staffing and Administration

The project calls for the coordinated efforts of a large and diverse group of scientists, planners and policymakers in 15 governmental agencies. Many of these agencies have offices in one or more of the five provinces in the S-C ecosystem, and the research and planning supported by GEF have occurred both within central government in Havana and at the provincial level. An important feature of the Strategic Plan is that these two layers of government will be integrated into a regional planning and management process led by the proposed S-C ecosystem Commission. This regional approach to resource management was represented at the beginning of the project by the Cayo Coco Ecosystem Research Center that has been the operational base for the scientific research and monitoring undertaken during the Phase 1 project, and is expected to play an increasingly important role as the development process unfolds in the archipelago. This three-tiered governance structure has involved the participation of more than 300 scientists, planners and other professionals throughout the duration of the project.

The administration of this large effort has rested on a small project staff that is housed in modest offices in Havana. The six-person project staff is composed of the project director, two senior scientists, an administrator, a purchasing agent and a driver.

The project has been overseen by a seven-member Comité de Dirección composed of the senior project staff and representatives of the lead units in the Ministry. This committee was chaired by the project director and has met regularly through the life of the project. Research and planning has been conducted through 11 working groups whose efforts have been coordinated by the two senior scientists. The working groups are organized by discipline as follows:

- (1) Information Systems and Remote Sensing
- (2) Oceanography (with subgroups in chemical oceanography, physical oceanography, geology and geophysics and coastal processes)
- (3) Marine Ecology
- (4) Terrestrial Ecology (with subgroups for fauna and flora)
- (5) Land Use and Cultural Resources

- (6) Resource Management in Biodiversity Protection
 - (7) Tourism
 - (8) Environmental Planning
 - (9) Meteorology
 - (10) Environmental Economics
 - (11) Construction
- (Working Groups (10) and (11) were formed in the last year of the project.)

The structure of these working groups reflects the strong disciplinary traditions within Cuban government and academia. This structure promotes priority-setting and discussion among colleagues who know each other well and have similar views as to how research should be undertaken and interpreted. The integration and debate that is required by ecosystem planning and management occurred through the joint planning sessions that produced the project's maps and electronic data base.

The planning process might have been more efficient if working groups had been structured by issue (an issue is defined here as a significant problem or opportunity) rather than by discipline. This perhaps would have been viewed as too radical a departure from traditional practice in 1993, but appears to be welcomed, at least among the project staff, as a viable option at the time of this evaluation.

2.4 External Technical Support to the Project

One-quarter of the UNDP funds (\$500,000) were assigned to consultant fees and expenses that were allocated to the approximately 10 visits of the senior technical advisor, James Dobbin, and to his team of specialists. The project staff feels strongly that Mr. Dobbin has made a major positive contribution to the project and that his methodology has provided a consistent approach and sequencing of activities, giving the project a road map that has been welcomed by all involved. The highlights of these visits have been the workshops that have produced the generalized use zones for the archipelago and the detailed site development plans for the four priority cays. These workshops were conducted both in Havana and in the provinces, and therefore involve both central government and provincial government project participants.

Supporting external technical assistance was provided by 12 specialists who came to Cuba to lead workshops on topics such as environmental planning and resource economics (see Appendix D). This training has added useful dimensions to the strategic planning process.

3. ACCOMPLISHMENTS AS CALLED FOR BY THE 1993 PROJECT DOCUMENT

This section summarizes what the project has accomplished according to the goals, objectives, outputs and activities listed in the 1993 Project Document. It addresses the basic question of performance evaluation, “Did the project meet the terms of the formal agreement as these were negotiated between the GEF and the government of Cuba?” The emphasis here is upon an objective and, where possible, quantifiable summary that evaluates progress according to the standards the project set for itself. Section 4 assesses progress according to standards suggested by GESAMP (1996).

3.1 Progress Towards the Fundamental Goals of the Project

According to the brief description in the cover sheet of the Project Document, the many outcomes and activities of this project can be grouped under three principle goals. This section summarizes the progress made during Phase 1 according to these three goals as follows:

1) *Equip the coastal ecosystem research center and thereby catalyze ecosystem monitoring and biodiversity research.* The 1993 Project Document assigned 54 percent of the GEF budget to equipment purchases. During the execution of the project, this allocation expanded to 62 percent. The unique circumstances within which Cuba is currently operating justified the large investment in scientific equipment, a GIS system, and transportation (vehicles and boats), without which the project would not have been able to achieve its objectives. By the time the project got underway in early 1994, the Cuban government had constructed the buildings that housed the Cayo Coco Ecosystem Research Center. The bulk of the scientific equipment acquired through the project has been used to equip this facility, which provides a field station in the S-C archipelago that is being utilized by resident and visiting scientists from a number of institutions. The field station has been the focal point for the biodiversity surveys and associated research that are called for by intermediate objectives 1, 2, and 3, and are the basis for the Strategic Development Plan. The GIS system and associated hardware are currently housed in the project offices in Havana, but are being used by the many collaborating institutions. Computer equipment has also been provided to offices in each of the five provinces in the study area. The unusually sophisticated and capable research and technical staff that is present in Cuba appears to be making good use of the large investment in equipment.

2) *Establish stronger functional links between the sciences and development interests.* This is probably the most notable accomplishment of the project. According to the Project Document, when activities got underway in 1994, research centers representing different academic disciplines worked in isolation from one another. There was very little meaningful collaboration between the Academy of Sciences (the original lead agency for the project) and the Ministries of Planning, Construction and of Tourism that were the major agents of change promoting international tourism development in the S-C

archipelago. Three years later, the situation is remarkably different. The Ministries of Tourism and of Construction and the Institute of Planning are major players in the project. Faculty and students in the academic disciplines from which their senior staff are recruited (civil engineering, architecture and economics) now feature programs and student theses that address the issues that are central to biodiversity conservation and sustainable development in the archipelago. Several architecture students have completed thesis projects that present environmentally-sensitive tourism resort facilities featuring a nature tourism theme and making use of innovative, low-impact building technologies and materials. The department of economics at the University of Havana has launched a new program in resource economics. The department of architecture is about to start a program in landscape architecture. Both of these are the first of their kind in Cuba and their presence can be attributed at least in part to the project. It must be recognized, however, that during the years that the project was underway, the Cuban government was being reorganized to implement new environmental management policies. The implementation of these policies dovetailed with the objectives of the project.

The interdisciplinary and interinstitutional integration that has been achieved is due in good part to the environmental analysis and planning techniques utilized. This called for working sessions at which scientists, planners and engineers worked together to analyze the features of a specific place and develop a plan for resort facilities and the supporting infrastructure in accordance with the goals of the project.

Many of the results of this process are already visible in the archipelago. They include the re-engineering of the berm road (constructed on fill) that was built in the 1980s to connect Cayo Coco to the mainland and that cut off circulation in the Laguna de los Perros. This caused hypersaline conditions, anoxia, and mortality of mangroves, seagrass beds and their associated fauna. By early 1997, a series of openings had been built in the berm road that have re-established circulation and are allowing this large lagoon to begin to recover.

The collaboration between the scientific and development communities have also led to reducing the projected number of hotel rooms in the archipelago by approximately 50 percent and radically changed the approach to resort developments. Today dispersed low-impact models have replaced the coastal strip development approach typified by Cancun that was the original model for tourism in the S-C archipelago.

3) *Developing a regional strategic plan for tourism and other activities within the context of environmentally sound management.* At the time of the final evaluation, a 265-page draft document entitled *Proteccion de la Biodiversidad y Establecimiento de un Desarrollo Sustentable en el Ecosistema Sabana-Camaguey*, and a much shorter executive summary, had been prepared. These present the major results of the project including a strategic plan for the archipelago. In its current state, the strategic plan demonstrates that the many outputs and activities called for by the six intermediate objectives and final outcomes stipulated by the 1993 Project Document have been met or

exceeded. The details of the strategy are presented in multi-paged tables that list a total of 162 objectives and actions. These are subsequently winnowed down to a still lengthy list of priorities. This approach to presenting a strategy does not do justice to the accomplishments of the project. The strategy would be a more forceful and operationally useful document if it was organized around the major issues posed by biodiversity conservation and sustainable development in the archipelago. Nonetheless, the ingredients for an effective management strategy are in place and, more importantly, there is a strong constituency that supports the values and the principal actions that it calls for. The most significant actions include:

- The application of the environmental analysis and planning methodology to all future development in the archipelago
- Further efforts to restore degraded areas, particularly those damaged by organic loadings from sugar refineries
- The restoration of depleted fisheries through licensing and inspections, and the creations of fisheries reserves in which all forms of exploitation are prohibited
- The designation of large areas of the archipelago as national parks and preserves
- The utilization of the rich base of environmental information in an impact assessment process and environmental inspection system
- The expansion of the ongoing environmental monitoring system
- The adoption of construction and waste treatment technologies appropriate to a nature-based form of tourism development

3.2 Strengthened Technical Capabilities

Intermediate objective 2 calls for strengthening “the scientific and environmental planning and management capabilities of Cuban agencies at the national, regional and local levels.” The Project Document establishes that the objective of improved science capacity is to enhance sustainable development and environmental conservation, and this is the standard by which we judge success of the steps that were taken.

At the project outset, the participating institutions already possessed highly professional technical staffs that were prepared to execute the project’s scientific activities in accord with the highest international standards. The primary needs for training were in integrated data management, cross-sectoral planning, and innovative approaches to environmental planning and site development. These needs were met by training abroad for a small number of key personnel, and through a series of in-country workshops and special training programs. Although the number of personnel trained through this program was small, it was appropriate in the context of the high level of scientific

professionalism in Cuba, and it effectively addressed the goal of improving that aspect of science capacity that is relevant to planning and management.

The crossover between science and policy was also enhanced by the consultative process by which the S-C Strategy and Site Plans were formulated. In all meetings with local institutions, the evaluation team found abundant evidence that scientists and other technical specialists were directly involved in the development of policy, new laws and regulations, and strategies for development and conservation. All scientists interviewed said their involvement in such activities had increased during the project and that they were adequately prepared for such involvement. We found that participating scientists had detailed knowledge of environmental laws, regulations and policy, as well as with the process by which they were developed. The majority of scientists interviewed had participated in an international discussion on environmental policy, and all scientists interviewed had participated in national and local forums where public policy was discussed and defined. This process of planning and policy formulation also involved engineers, architects and planners.

Given the high level of technical preparation in the participating institutions, the primary limitation to technical capacity at the project's outset was the lack of scientific supplies and technical equipment. The project's contributions in this area were concentrated in the research station at Cayo Coco, in accord with Immediate Objective 1. While the stated Outputs 1.1 and 1.2 were fully achieved, the evaluation team notes that the overall objective was to improve the capabilities of the Ministry of Science, Technology and the Environment and other relevant agencies. The capacity of many institutions to participate in long-term activities initiated by the project remains compromised by shortages of equipment and supplies, and (to a lesser degree) by the lack of specific software. In the context of improving science for the purpose of supporting management, it would be desirable for the improvements to be broadly distributed among participating institutions.

3.3 Strengthened Scientific and Environmental Planning and Management

Implementation of this project was accompanied by an extensive reorganization of the environmental institutions and agencies in Cuba. These actions included institutional reviews and reforms, creation and implementation of new environmental legislation, development of appropriate regulations, compliance and incentive systems for development activities, and revisions to the roles and mandates of environmental agencies. The GEF project contributed technical expertise to these reforms and was the first major environmental project to test their operational viability. The project's steering committee brought together a diversity of institutions to examine and debate environmental policy as it applies to the S-C ecosystem and to specific development proposals.

3.4 Developing Scientific Information for Management and Sustainable Development

In order to provide both environmental data and the information services that are necessary to make it useful for planning and management purposes, the project included 1) an accelerated program of resource evaluation and inventory in the project area, and 2) the introduction of new information management technology including GIS mapping and electronic data bases.

1) Success of Resource Evaluation. At the project outset, the S-C archipelago was one of the most poorly known regions of the Cuban coastal zone. The initial assessments of its significance for biodiversity on a global scale were based on the “slide-rule” method of using habitat diversity as a preliminary estimator of biological diversity. The project therefore undertook a regular program of inventories to rigorously document the area’s living resources both qualitatively and with respect to their geographic occurrence. These activities resulted in an increase of basic knowledge about biodiversity of many major groups in the Cuban biota by factors ranging from 9 percent (in the case of isopod crustaceans) to 150 percent (in the case of amphipods), according to technical papers published by the project staff in the international scientific literature.

The evaluation team notes very considerable achievements in Outputs 3.1 to 3.4 which call for preliminary assessments in physical, marine biological, terrestrial biological and cultural resources. During this initial phase of resource assessment, the project used a strategy of extensive surveys that was designed to provide a maximum of new data in a short period of time. Although this approach involves a number of technical compromises, these were economically justified and the evaluation team judges the resource assessments to have been very highly productive. It must also be noted that the high rate of encounter of unknown forms of biodiversity implies that knowledge of living resources is still at a preliminary level in the project area. The locality-based assessments carried out by the project provide substantial confirmation of the original predictions that the S-C archipelago, with its complex mosaic of shallow marine environments, would prove to be a critically important region for the protection of marine biodiversity.

2) Success of Information Management Systems. During the period that the project was underway, several of the participating institutions developed electronic data systems for the first time, and the project’s support for the transition in information management must be counted as one of its most catalytic and far-reaching effects.

Major emphasis was placed on the development of the GIS as the core element for integrating data that is of diverse kinds and that might originate in a variety of institutions with diverse technical orientations. GIS training was provided by a consultant who worked with the remote sensing group to develop base maps and thematic layers. A preliminary GIS system was installed late in the project. The system in place satisfies the goals of providing preliminary resource maps, although it did not draw widely on information sources in specialized institutions. This system should be followed up by

transferring a greater amount of GIS technology to the country's technical institutions, and by providing electronic communication links that would support an interinstitutional network of environmental information.

The value of any GIS as an approach to integrated information management across social sectors is limited by the extent to which the data systems in various institutions have themselves been computerized. It is also limited by the degree of standardization with respect to file structure, field structure, units of measure and problems of scale. The project made considerable progress in the conversion of data to electronic format in a number of institutions, and it established the basis for them to initiate a national data-standardization process. Such a process, with emphasis on the relational databases that support most policy queries, should be fundamental in future programs to improve access by policy-makers to information that is relevant to management.

As in all Caribbean island countries, the original surveys of Cuba's natural resources were carried out predominantly by institutions based outside of the Caribbean Basin. As a consequence, much of the basic information about Cuba's biodiversity and natural systems is now located abroad (a circumstance that is repeated in every island state of the region). This body of baseline data includes information about pristine conditions that is of critical importance for programs in habitat rehabilitation, as well as information about the response of the biota and of ecosystems to the perturbations caused by the agricultural and urban development of the island over a 500-year period. Both of these kinds of information are necessary to other activities in the project, as well as for the continuation of environmental mitigation efforts in the future.

An important consequence of the project's activities in information management is that participating institutions now have the capacity for the first time to effectively repatriate data about Cuban natural resources from foreign databases, most of which have substantially completed the electronic reformatting of their data. The establishment of electronic "receptacles" for environmental information (i.e., relational databases in Cuban institutions) makes it possible to receive downloaded information from counterpart institutions as well as to gain instantaneous access to most of the relevant information that currently exists. This capacity is equivalent to carrying out decades of new resource assessments, and it provides a fundamental advance in institutional development.

3.5 The Strategic Plan for the Sabana-Camaguey Ecosystem

1) The Development Strategy. Following the adopted methodology, a major effort has been made to synthesize information on the environmental characteristics of the archipelago on a series of maps. These became the basis for identifying spatially-defined, environmentally-sensitive areas and areas that should be designated for protection. Such mapping occurred at two scales: for the archipelago as a whole, and at a much more detailed scale for the four sites where the pressures to develop tourism resorts are most intense. This mapping has produced a generalized zoning scheme for the entire archipelago at scales of 1:1 million and 1:250,000 that is based upon the major features

and qualities of the ecosystem and recommendations for the designation of a national park, a series of ecological reserves and a series of fisheries reserves. The second major outcome is a site-specific environmental analysis and planning process (at a scale of 1:50,000 and 1:25,000) that provides developers and regulatory institutions with a powerful tool for designing tourism facilities in a manner that minimizes their environmental impact and supports the goal of nature-based tourism in the archipelago. The techniques of environmental analysis and planning that underlie the mapping procedures have been the subject of a number of workshops and training sessions held both in Havana for institutions of central government and in the five provinces of the S-C ecosystem.

It is significant that such mapping and detailed site planning has not been an academic exercise but has already reshaped the planning and development process in the archipelago. For example, a resort development proposed for Playa Pilar was withdrawn when this was shown to be inconsistent with the generalized zoning scheme. Site plans and engineering plans for the expansion of resort facilities in Cayo Guillermo were extensively modified.

The second major feature of the project's approach to strategy formulation was to introduce the Cubans to the diversity of experience in tourism development and its impacts throughout the Caribbean. This featured a study tour to seven Caribbean nations that resulted in a detailed report prepared by the participants. The tour, combined with a number of training courses held in Cuba, provided project participants with a host of ideas on those forms of development that could be considered desirable and undesirable for the S-C ecosystem. Thus, scientific information on the characteristics of the S-C ecosystem was integrated with new tourism design concepts and tourism market data to provide the project with the information and ideas upon which the strategy is based.

These activities resulted in progress on all activities listed under Output 4.4.1 including specifically:

- A system for classifying marine and coastal species according to their conservation status (Activity 4.1.1)
- An ongoing environmental monitoring program conducted by the Cayo Coco Ecosystem Research Center that features monthly surveys of such variables as salinity, temperature, oxygen, fecal coliform, beach profiles, etc. At present, monitoring is directed at areas in the Cayo Coco vicinity where tourism development is currently concentrated. A more comprehensive monitoring system is being designed.
- Several species recovery plans (Activity 4.1.3) have been developed
- Critical habitats have been identified (Activity 4.1.4) at a generalized scale for the entire archipelago.

- Species subject to overfishing (Activity 4.1.5) have been identified.

2) *Development Guidelines.* Development guidelines are embedded in the site-specific mapping and analysis process. The four detailed site plans, and a number of student theses completed in the architecture and civil engineering departments of the University of Havana, provide examples of the environmentally-sensitive planning and engineering that is being successfully promoted by the project. The draft project report contains numerous tables and boxes that identify specific techniques that can be used to mitigate specific human-related impacts, for example, by using gray water for irrigation, landscaping with native species, minimizing the size of the areas disturbed during construction, using alternative energy sources and applying innovative technologies for sewage treatment and disposal.

3) *Designation of Sensitive Areas.* One of the key recommendations emerging from Phase 1 of the project is for the designation of a system of protected areas within the archipelago. One of these would be the second largest coastal marine park that features coral reefs. The largest coral reef park is the Great Barrier Reef in Australia. The protected areas identified for the S-C archipelago, however, had not been formally designated at the time of the final evaluation, but the proposal appeared to be supported by the responsible institutions. The proposed marine park is complimented by a proposal for several fisheries reserves that, if adopted and implemented, would be free from all forms of fishing and should contribute to the recovery of several important but currently over-exploited species of fish and shellfish.

The designation of environmentally-sensitive areas and areas designated for protection is a major feature of the site planning process. Thus, in the four cays to which this methodology has been applied, areas designated suitable for development are restricted to less than a third of each study area. These designations appear to have been accepted by the Ministries of Tourism and Construction and have already had a major impact on the development process in these sites.

3.6 A Public Awareness Program

Intermediate objective 5 and the final section of the Project Document on “Expected End of Project Situation” outlines a public education program that features:

- Information dissemination through public media
- Exhibits and interpretive centers
- Natural history tours

Public dissemination has taken place through television, radio and newspaper. In all three media, the issues addressed by the project and some of its major accomplishments have been featured both nationally and provincially. Two videos produced by the project have been aired on national television and on the station that serves the five provinces of the S-C region. Television, radio and newspaper coverage, including major features, have occurred most frequently in the provinces of Villa Clara and Sancti Spiritus since it

is there that the project has been most active. At the national level the NGO Pro Naturalesa has provided a means for disseminating project results through its speakers, curriculum materials and “citizen science” programs.

A strong effort has been made to target the ideas and information generated by the project on school children. Here again, the most impact has been on schools within the S-C region. School activities have included field trips to readily accessible sites, specific projects (e.g., beach clean-up) and speakers invited by interested teachers.

Another target audience has been the fishermen who operate in the archipelago’s waters—both the commercial fishermen and the increasingly significant recreational fishermen. Here the focus has been on the need for reserves and controls on harvest rates.

The creation of museum exhibits has been limited to modest displays in the Cayo Coco station. There are natural history tours available to tourists through the hotels in the archipelago. These currently feature diving excursions and visits to such attractions as the flamingo colony.

The Project Document makes no mention of impacts on Cuba’s formal education (school and university) curricula that has emerged as a significant accomplishment of the project. The project has, however, had a major impact on both. The new university programs in landscape architecture and resource economics may be directly attributed to this project. Both the undergraduate and graduate program in marine biology and aquaculture has been enriched by the project. Nine Master’s degree and three Ph.D. theses address topics in the S-C archipelago and have been supported directly or indirectly by the project. In addition, three senior projects in architecture, one Ph.D. on beach dynamics and two Ph.D.s in systematics have addressed topics of direct relevance to the project.

3.7 Analysis of Existing Climatic Data

The compilation of climatic information was carried out by a study group formed in 1994. In fulfillment of Output 6.1.2, the group developed a database of weather measurement maintained in the Institute of Meteorology. It contains historical data as well as the results of weather monitoring since 1996, when the accumulation of data from the project area was accelerated. The database is based on the system CLICOM which, according to the specialists interviewed, is a standard used internationally. The system is geo-referenced and could technically be integrated with other information systems, although to date, only preliminary consideration has been given to this possibility.

The information system should make it possible to obtain additional data from international sources from existing climatic data using electronic methods. This option, however, is not currently being pursued; neither is there a program to acquire remote-sensing data on the scale of the entire project area.

Apparently, there is not yet an effort to develop data standards that would enhance the inter-use of meteorological data across sectors. Nonetheless, information from the database is apparently widely accessible to project participants, as all of the project's study groups were able to present detailed climatic data relevant to their own specialized presentations.

4. STRATEGY DEVELOPMENT PROCESS

This section assesses the project in accordance with the steps and priority actions for a coastal management program recommended by GESAMP (1996). It is important to recognize that this treatment holds the project up to standards that are somewhat different from those described in the Project Document. The GESAMP process, however, is fully consistent with the strategic planning process set forth in the Project Document, but provides a greater level of detail and suggests a sequence of actions that are implied—but not explicitly stated—in Figure 7 of the Project Document.

4.1 Local Ownership of the Project

The GEF Operational Strategy states (p. 14):

Sustainable achievement of global biodiversity benefits will greatly depend on the extent to which GEF activities are country-driven.

One of the strengths of the project is that it is “owned” by Cuban institutions. The project director and senior staff are all Cubans of exceptional capability and dedication. The government of Cuba views as a priority the adoption of the principles and guidelines of Agenda 21 and this is causing significant policy reforms across governmental institutions. The GEF project is seen by both the UNDP country office and by the Ministry of Environment and Technology as an important vehicle for making tangible progress towards sustainable forms of development. The importance of the project to the Cuban government is reinforced by the significance of the S-C ecosystem in the country’s strategy to promote international tourism as a means of earning urgently needed foreign currency. Together, these factors have placed this GEF project higher on the national agenda of priorities than is the case for GEF projects of a similar dollar value in other nations. The fact that it is led by nationals, and reaches deep into national and provincial institutions, has generated a remarkable degree of ownership and pride in this effort.

4.2 Initial Identification and Assessment of Ecosystem Management Issues

The three fundamental issues that prompted the selection of the S-C archipelago as the site for a GEF project are set forth in the Project Document. They may be summarized as follows:

1) Biodiversity. Cuba probably has the highest biodiversity in the West Indies. The archipelago contains a particularly high level of both biodiversity and endemic natural life. The offshore cays are amongst the most important tracts for the preservation of Cuban terrestrial biodiversity. At the start of the project, Cuban capacity to carry out the scientific surveys required to document the region’s biodiversity was severely

constrained by the lack of the necessary equipment. According to the Project Document, inventories were in a preliminary state, information on the distributions of most species was not available, management plans for endemic and migratory species did not exist, and environmentally sensitive areas had not been delineated.

2) *Tourism Potential.* By 1993, tourism had been identified as a priority sector for economic development in Cuba. Several thousand hotel rooms were slated for construction in the cays of the S-C ecosystem. The risks posed by such development, according to the Project Document, included:

- A possible failure to ignore changing trends in international tourism
- Problems posed by the seasonality of tourism
- A failure to capitalize on ecotourism
- The potential to inadvertently damage ecosystem qualities
- A potentially low cost benefit ratio due to these factors

These concerns produced considerable interest in ecotourism and other forms of tourism rather than the traditional enclave, Cancun-like, development with its high demand for infrastructure and potentially undesirable social implications. If the potential for ecotourism in the S-C ecosystem region was to be exploited, special attention would need to be given to transportation to remote areas and the construction of suitable accommodation facilities. The Project Document notes that the existing zoning and detailed physical plans in the S-C ecosystem did not adequately consider environmental and biodiversity concerns. Furthermore, it noted that the implementation and enforcement of approved physical plans was poor and that the linkages between science and natural resource agencies to planning and development agencies were inadequate. In particular, detailed physical plans drawn up for Cayo Coco were similar to those of Cancun and could be confidently predicted to result in significant environmental degradation.

3) *Environmental Planning.* In 1993, Cuba had a well developed decisionmaking process for physical planning and the allocation of land to different uses. Detailed physical plans had been drawn up to develop Cayo Coco as an international tourism resort on the Cancun model. Similar plans for other offshore cays were underway. One hotel and the first of a series of roads connecting these tourism sites had been built. These plans and structures, however, threatened to have a serious negative impact on the quality of the ecosystem and the biodiversity it supports. The inadequate consideration of environmental issues and biodiversity concerns in land-use allocations and tourism planning was therefore identified as a major threat. Furthermore, the implementation and enforcement of approved physical plans was found to be poor. According to the Project Document, these problems existed in large part because the flow of information between scientists and natural resource agencies to planners, engineers and development agencies was poor.

Both the lengthy process of designing the project and its implementation illustrate the difficulties of making the transition from traditional natural science research to the

analysis of clearly defined resource management issues in order to formulate public policy design to promote sustainable forms of development. In Cuba, the project design processes began in 1988. Before a proposal was sufficiently developed for formal consideration by the GEF, two rounds of planning occurred. The first produced separate research proposals for marine and terrestrial topics. The second integrated the two into a somewhat more coherent package of individual research projects. In a third attempt, non-scientists and managers from the Ministries of Tourism and Fisheries were incorporated into the planning process. This time a more integrated research plan emerged. According to Dr. Alcolado, this plan continued to be based on the assumption that the provision of sound scientific information would provide a foundation of “truth” from which appropriate management actions would flow logically and easily. At this stage there was little awareness of the process by which public policy is negotiated and the need for a strategic approach to prioritizing and sequencing tasks.

This GEF project has provided the first major opportunity for Cuban specialists to engage in interdisciplinary research at the ecosystem scale with the objective of developing a comprehensive plan and supporting public policies. It has been an intensive learning process. The senior technical advisor succeeded in promoting an approach that began by compiling and mapping information within each of the disciplinary groups (see Section 2.3). Each group identified problems, the evidence of such problems and the potential strategies that could alleviate them. The problem analysis process focused upon the sources, pathways and receptors of environmental stress. This process proved to be very helpful, but it did not crystallize thinking around a short list of priority management issues (defined here as encompassing opportunities as well as problems) that could provide the backbone of a strategic plan. The result is that each working group developed voluminous reports that include lengthy lists of problems and possible actions. These are summarized in the “Synthesis of Results” report that is one of the major products of the project. The management strategy, in the form of an executive summary reviewed at the time of the evaluation, would benefit from a structure that more directly addresses the major issues. These are identified and briefly described in Sections 4, 5 and 6 of the executive summary and may be listed as follows:

- Organic loadings from the untreated wastes of sugar mills that have led to large areas of anoxic conditions in several lagoons
- A marked reduction in fresh water inflows to estuaries due to the construction of dams on rivers
- Potential impacts from oil and gas drilling operations in the western end of the region
- Overfishing of several commercially important species
- Threats from discharges or a wreck of vessels transiting the major shipping lane that lies between the archipelago and Barbados

- The construction of berm roads (Pedraplenes) linking the keys to the mainland
- The absence of a strategic plan for both conservation and development
- The absence of guidelines for an appropriate architectural design for new tourism facilities
- A tourism development plan that calls for intensities of use that are likely to cause significant damage to the biodiversity and environmental qualities of the region
- Inadequate implementation of existing protected areas
- The absence of an analysis of the economic implications of development.

4.3 Inter-institutional Agreement on Project Goals

On several occasions throughout the evaluation, the team questioned those being interviewed on their understanding of the fundamental goals of the project. The replies were given without hesitation and were remarkably consistent. All respondents emphasized the need to balance a diversified low-impact tourism in the archipelago with the need to protect the region's biodiversity and environmental character. The theme of sustainable development was raised repeatedly. This consistency in response came from members of the scientific community, planners and architects, and representatives of the Ministry of Tourism. It was reflected by participants based in Havana as well as those involved in the project at the provincial level.

Many of those interviewed stressed that the biggest accomplishment of the project was a change in mentality among those who had participated in the project. Representatives of the tourism industry were impressed that the scientific community had become more sensitive to the needs of tourism and had a much greater understanding of what kinds of information and ideas were of practical usefulness to guiding the development process. Similarly, the scientists participating in the project spoke of a radical change in the attitudes of developers, architects, and the Ministry of Construction as they learned how to minimize environmental impacts and safeguard the biodiversity and environmental qualities of the region. The economic benefits of this approach are now recognized by both parties. This shift in attitude is a major accomplishment and the fulfillment of one of the fundamental goals of GEF projects which states:

[The project] will establish a stronger functional link between the sciences and development interests.

4.4 Identification of Planning Priorities

A strategic planning process requires focusing on a few carefully selected management issues and/or geographic areas. This process of prioritization was achieved primarily by classification of geographic areas into the three categories of use, first at a generalized

scale for the archipelago as a whole, and again for four cays selected as those places where the pressures for tourism development are currently most intense. These four cays are:

- Santa Maria
- Guillermo
- Coco
- Sabinal

The procedure for identifying priorities for action occurred through the deliberations of each of the thematic working groups. Information gathered in the first phase of the project was displayed on base maps of the region and, where relevant, of the four pilot sites. Such maps were accompanied by summary data tables and text on each topic. Each section of text ended with the identification of issues and recommendations on how the results of the analysis should be integrated into the ongoing planning process. The project's senior scientists worked with each of the thematic groups to develop these materials. The result is a large folder of text, tables, graphs and maps produced by each working group that is kept in the project office. These materials, in turn, became the inputs for the summaries that appear in the draft final document. The summaries were prepared by the senior scientists assigned to the project and were negotiated with each of the working groups and with the Comité de Dirección that met monthly beginning in January 1996 and was responsible for overseeing the content of the final document. This lengthy process of consultation and negotiation required a great deal of time and energy for all concerned and vested in the two senior scientists the responsibility of producing a coherent document. Here again, the process would have been more efficient and would have strengthened the capabilities of all those participating in the working groups and provided a fuller appreciation for a strategic planning process if the working group had been organized by issue rather than by discipline.

4.5 Strengthening Technical Capabilities

As noted in Subsection 4.2, the project's principal accomplishment, according to many of those who have participated in it, is a change in the attitudes of the scientific and development communities involved in the project and their adoption of a common methodology for ecosystem planning and development. This translates into a significant change in the technical capabilities for sustainable development and biodiversity protection in Cuba. This strengthening has occurred in five principle areas:

1) *Science for Ecosystem Management.* The very large investment in scientific equipment and the technical capabilities now in place in the Cayo Coco field station has provided the S-C ecosystem with a powerful platform for biodiversity research and monitoring. This equipment is used by scientists, including junior scientists completing their Master's or Ph.D. degrees, who hail from a large number of institutions.

2) *The strategic planning and mapping process.* Supplemented by the training provided by foreign consultants, the process has provided a large cadre of professionals

with analytical and planning tools that have a very high potential for being usefully applied not only to the continuing development of the S-C ecosystem but to other regions of Cuba.

3) *The GIS system.* This provides a powerful tool for promoting transdisciplinary research and analysis. Training sessions in the GIS system have been provided to many project participants, according to the team leader of the GIS working group. Since the system operates on personal computers, the potential for decentralization is great. Computers capable of utilizing this information system have been purchased for regional offices in each of the five provinces.

4) *The international study tour.* This special trip exposed an interdisciplinary group of scientists, an architect, a planner and resource managers to the potential impacts of development and the alternative paths that a tourism development strategy could follow. Several of those interviewed for this evaluation believe that exposure to such examples and the development of personal contacts within the Caribbean region would be of great benefit to a larger number of Cubans, particularly those most directly involved in the design of tourism facilities and the promotion of diversified tourism offerings in the S-C region.

5) *Technical and Professional Training.* The activities of the project have provided numerous opportunities for professional training. These have resulted in a substantial capacity building for individuals directly or indirectly involved in the project. A total of 75 training activities were carried out, including 33 short study fellowships, eight working missions, eight local study trips, 20 international consulting actions and attendance in 20 international meetings. Among these, 13 courses were given to project specialists, and numerous workshops and locally organized seminars were attended by about 250 project participants. The fields covered in these training activities were diverse (see Appendix D). The target professionals for the training included planners, architects, engineers, scientists, construction officials and protected area personnel based both in Havana and the provinces.

4.6 Documentation of Baseline Conditions

The Project Document does not call explicitly for the development of baselines against which future change in the S-C ecosystem can be evaluated. Nonetheless, the emphasis upon the gathering of scientific information in intermediate objectives 1 through 3 and 6 has resulted in the generation of a large volume of data that document biodiversity and the qualities of the S-C ecosystem. When the project got underway in 1994, there was considerable debate as to what approach to biodiversity documentation should be utilized. The conclusion was to follow extensive survey procedures developed (1) by ORSTOM which called for a large number of stations and survey techniques that do not call for replicate samples, and (2) by IUBS/IABO for both intensive and extensive inventories.

During the project, baseline documentation was dedicated only to environmental variables. It would have been appropriate and useful to have broadened the scope of baselines to include surveys of the responses of tourists to the qualities of the archipelago and the facilities that have been built. Such information could be important when planning future development. The perception of those interviewed from the Ministry of Tourism is that the great majority of tourists presently coming to Cuba are drawn by the prospect of “sun and sand” and that only a small minority are interested in nature and culture attractions. These assumptions should be verified and trends in such perceptions analyzed.

4.7 Design and Implementation of Monitoring Protocols

According to the Director of the Cayo Coco field station, the primary objective of the installation is to “velar por la biodiversidad del archipelago.” This calls for monitoring for trends in biodiversity, threats to biodiversity and the environmental qualities of the region, and then demanding action where this is needed. At the time of this evaluation, a monthly monitoring program was in the process of being implemented by the field station that featured:

- Salinity
- Water quality
- Beach processes
- Climatic variables
- Seagrass beds

The existing monitoring activities were presented to the evaluation team as an initial effort based on the interests of provincial officials and individual researchers. A single monitoring program directed at management priorities will be designed for the next phase. The monitoring being conducted by the field station is being supplemented by less formal surveys carried out by the provincial groups that have been catalyzed by the project. These include, for example, monitoring the nesting success of marine birds and monitoring areas of anoxic conditions and coral bleaching. It was not clear if these efforts, which include “citizen monitoring,” are currently being incorporated into a single unified system maintained by the field station. This should certainly be an important objective in Phase 2 of the GEF effort.

The evaluation team is of the opinion that a sustained monitoring program needs to be:

- More carefully targeted on areas where change is known to be likely and significant, as well as on carefully controlled sites that will assist in separating change caused by human-related forces from naturally occurring variability within the ecosystem. The current program did not appear to be sufficiently targeted upon existing or potential problem areas and the frequency of sampling in some cases was excessive (e.g., monitoring fecal coliform in areas distant from any sources of sewage pollution).

- Focused on monitoring of human uses and perceptions. For example, surveys of the reactions of tourists to the qualities of the archipelago, their interest in returning for another vacation and perhaps willingness-to-pay can assist the planning of further development in the archipelago and enable a quick response to problems and opportunities.

4.8 Public Awareness and Involvement

The Center for Information, Dissemination and Education within the Ministry of Science, Technology and the Environment has designed and executed the major elements of the public education component of the program. According to the chief of this unit, all elements of the project had an education component. These educational activities have included television programs, three booklets and several videos. The evaluation team, however, did not have the time to review these products. These “informal” education activities have been complemented by materials for school curricula and new university programs that have been sparked by the project. As mentioned earlier, the latter have included establishing programs in landscape architecture and environmental economics. A number of university theses have either been sponsored or assisted by the project. The project has also assisted two tourism schools that train personnel in the S-C ecosystem.

4.9 Early Implementation Actions

International experience demonstrates that it is extremely important to begin testing the feasibility of the policies and actions developed during a phase devoted primarily to planning in order to (1) build constituencies of the program by demonstrating its tangible impacts and (2) test the feasibility of the strategies that are being proposed. This program is exceptional in the number of early implementation actions that have been taken and that have informed the management strategy. This achievement has been aided by the dedication and competence of those working within government agencies in Cuba and the absence of the tensions that usually characterize the relationship between the private and public sectors. The early actions that have been prompted by the project and undertaken during its execution may be divided into three major categories:

1) Changes to the design and construction of tourism facilities in the archipelago.

When the project got underway in 1994, Cayo Coco offered dramatic examples of the mistakes that the prevailing construction practices can produce and the high cost of the environmental and business impacts that result. The berm road linking Cayo Coco to the mainland had been built in 1988. This 17 kilometer-long road across the Bahia de los Perros had blocked circulation within the lagoon. This caused a dramatic increase in the salinity of portions of the lagoon (at times exceeding 80 parts per thousand) and the subsequent mortality of seagrass beds, mangroves and their associated fauna. During the GEF project, the Ministry of Construction, with the advice of the scientists involved in the project, redesigned the causeway and made a series of openings that have re-established water circulation and are now permitting the recovery of the lagoon. This

experience led to consultation between engineers and the scientific community when another much longer causeway was designed for Cayo Santa Maria. Construction of this 38 kilometer berm road began in 1993 and was nearing completion at the time of this evaluation. Here the design is notably different with large numbers of bridges and the environmental impacts appear to be far less severe.

The project has also had a major impact on the siting and design of resorts. Here again, the first two hotels built on Cayo Coco provided a good example of what not to do. The Tryp Coco Hotel, with 458 rooms, had been completed by the time the project got underway and the Tryp Club, with over 500 rooms, was being built. These are massive four-story structures that are built on the dunes and cut off visual access to the shore. These facilities have few positive visual attributes and their rigid and insensitive design may be contributing to its low occupancy rate—running at 65 percent at the time of the evaluation. This initial hotel facility contrasts strongly with the installations that have been built more recently on Cayo Guillermo. Here the site planning and design of installations was strongly influenced by the Dobbin site planning exercise and the study tour. The facilities are visually unobtrusive and their design appears to be appreciated by the patrons interviewed during this evaluation. This facility is operated through an agreement with an Italian firm, which succeeds at keeping a high occupancy rate year-round.

Perhaps the most dramatic impact of the project has been upon a resort proposed for Playa Pilar on Cayo Guillermo. The original plans called for a large facility built in the dunes overlooking this secluded and beautiful beach. The project team prepared a detailed review of the proposal that carefully analyzed the impacts of the proposed hotel and ended by recommending that the plan be withdrawn and the site designated as a park in which no permanent installations will be built. These recommendations were accepted and the project canceled.

Construction guidelines detailed in the draft strategy are also being applied to facilities now under construction in the archipelago. According to the representative of the Ministry of Tourism, these guidelines (distributed as a booklet by the Construction Working Group) have greatly reduced the amounts of material that are disturbed during the construction process. For example, an estimated 600,000 m³ of material was bulldozed during the construction of the first hotel, as compared to 8,000 to 12,000 m³ during the construction of the Cayo Guillermo Resort. Such modifications to construction practices not only reduce environmental impacts, but also the costs of construction.

2) *Environmental Impact Mitigation, hazard prevention and habitat restoration practices.* These are featured in the draft strategy and are being voluntarily implemented thanks to the initiative of provincial level working groups. These actions include:

- Broadcasts in three languages to ships operating in the vicinity of the archipelago warning them that they are in the vicinity of a marine reserve and requesting that

no discharges be made while in the vicinity. This initiative may have reduced the incidence of tar balls on beaches in the archipelago.

- Operators of small aircraft have been asked to cease a practice of buzzing the flamingo colony that contains approximately 100,000 individuals. This was becoming a common practice for pilots catering to tourists.

3) *Volunteer Actions.* The provincial working group in Sancti Spiritus province provided the evaluation team with a number of examples, many of which are the result of initiatives by interested citizens not formally associated with the project. For example:

- A number of “citizen monitoring” initiatives are underway to document trends in the populations of manatees, flamingos, bats, and nesting marine birds. This monitoring suggested that the collection of eggs from the nests of sea birds was reducing the success of hatchlings. This led to curtailing the activity, and hatchling success appears to have recovered.
- A “practical exercise” is underway to test the feasibility of using nutrient rich wastewater from a sugar refinery for irrigation. An initial effort to reduce wastewater inflows by use of an oxidation lagoon had met with little success and continued to cause anoxic conditions in the neighboring lagoon.
- When a sewer line from the largest town broke and was contaminating the adjacent lagoon, a youth group undertook the necessary repairs.
- Another practical exercise is investigating the feasibility of restoring natural drainage patterns to coastal wetlands.

4.10 Evidence of Adaptive Management and Incremental Design

Major changes in the institutional structure within Cuba have had major positive impacts on the project. In 1994, the responsibility for the project passed from the Academy of Sciences of Cuba to the newly created Ministry of Science, Technology and the Environment, and a new director of the project was appointed. This slowed project activities for several months, but once the transition had been made the project moved forward rapidly and has been able to respond to a number of significant opportunities. These have included the initiation of an environmental impact review process and a system of environmental inspections and operating certification.

The highly participatory process, which has characterized the proceedings of the 11 working groups, and the consultative process by which the strategy has been developed, have required great flexibility and adaptation on the part of all concerned. The openness of those participating in the project to new ideas and experience brought to Cuba by the senior technical advisor and resulting from the study tours also demonstrate the willingness of those participating in the project to incorporate new ideas and adapt to changing circumstances.

5. STATUS OF THE DRAFT STRATEGIC PLAN FOR THE SABANA-CAMAGUEY ECOSYSTEM AND ITS IMPLEMENTING FRAMEWORK

5.1 The Current Institutional Framework for Ecosystem Management in Cuba

Cuba was an active participant in the 1992 UNCED Conference. Activities leading up to the UNCED Conference and in response to Agenda 21 have dramatically changed the institutional context for ecosystem management in Cuba and fostered a dedication to progress towards sustainable development. These new policies have been spurred on by the impacts of the United States embargo which have forced Cuba to become less reliant on fossil fuels and agrochemicals and to give very serious consideration to promoting a diversified nature-based tourism on the island. The formulation of the management strategy for the S-C ecosystem and its future full-scale implementation will require the coordinated efforts of several ministries under the leadership of the Ministry of Science, Technology and the Environment. The ministries most important to the S-C Strategy are:

- The Ministry of Construction
- The Ministry of Economy and Planning
- The Ministry of Tourism
- The Ministry of Fishing Industries
- The Ministries of Education and Higher Education
- The Ministry of Armed Forces (as Geo Cuba).

The current status of the policies and procedures of these ministries as they apply to the S-C ecosystem management strategy are as follows:

1) *The Ministry of Science, Technology and the Environment.* The biggest hurdle for the project staff was to obtain the approval of the draft strategy by the ministry's directorate of environmental policy. This office reports directly to the minister and it oversees the development and adoption of Cuban environmental policy. The Centro de Gestion y Inspeccion Ambiental is another important entity in the new ministry and promulgated regulations in 1995 that call for environmental impact assessments (EIA) for significant development proposals and a system of inspections that are the basis for operating permits. This is a new system and is still in the early stages of developing its operational procedures. There is not, as yet, a clear definition of what projects require an EIA or a specification of the criteria by which operating permits will be granted or denied. This does not imply, however, that this new system of environmental control is not already having a significant impact. For example, one hotel already under construction in Cayo Coco in 1995 was subjected to an EIA and was made to adjust its design and construction practices in response to the analysis. The Centro de Informacion, Divulgacion y Educacion Ambiental oversees all public outreach and public education programs of the ministry.

The Ministry of Science, Technology and the Environment was created in 1994, and a new Law of the Environment was formally adopted in July 1997. This provides an umbrella for two laws that will have a direct bearing on the future management of the S-C ecosystem:

- The law for the protection of biodiversity
- The coastal management law

The former features controls over exotic species and measures designed to protect Cuba's biodiversity and endemic species. The coastal law will provide for a system of construction setbacks that will be designated by shoreline type and by type of use.

2) *The Ministry of Construction.* This Ministry works with the Ministry of Armed Forces, the Ministry of Agriculture and the Ministry of Physical Planning to develop the provincial master plans that guide land use throughout Cuba. The Ministry became an active participant in the project in 1996. The Construction Working Group was formed in September of 1996 and has been very active and has produced:

- Guidelines for construction in the cays: This began with an examination of past development actions and their impacts, and proceed to provide specific guidelines for the principal forms of construction in the project area
- The environmental instructions for the design and installation of temporary facilities during construction
- A code of ethics for the construction industry

This Ministry is closely associated with the architecture faculty of the Polytechnic Institute and the above documents have been influenced by several thesis projects.

3) *The Institute of Physical Planning in the Ministry of Economy and Planning.* The Institute was created in 1960, opened offices in each of the provinces in 1976, and began opening offices in major cities and towns in 1985. The Ministry employs 2,000 professionals, primarily geographers, engineers, architects and planners. National physical plans are at a scale of 1:1 million or 1:500,000. Provincial plans are prepared at scales of 1:250,000 to 1:1000,000; more specific plans at scales appropriate to the kind of development envisioned.

The Ministry of Economy and Planning developed the original master plans for the development of the S-C archipelago in the late 1980s. Because of the projects, these have been drastically revised so that both the amount of development and the style of development reflects the goals of the GEF project. Anselmo Pagés, the deputy director who met with the evaluation team, expects that this process of revision will continue on into the future. The Ministry has prepared legislation for a new law on land use, planning

and urban development which will strengthen the incorporation of environmental issues into the formulation of master plans.

4) *The Ministry of Tourism.* This Ministry was created in 1987. Its small staff of 32 professionals defines Cuba's tourism policy and does not manage the activity itself. The latter is done by the various Cuban tourism agencies with support from educational units and other ministries, as appropriate.

5) *The Ministry of Fishing Industries.* The Ministry of Fishing Industries is responsible for one of Cuba's major productive sectors. Lobster and shrimp alone provide approximately \$150 million in foreign income per year, and its distant water fishing fleets are a major source of food for the nation. The Ministry has been more successful than other Caribbean nations in managing its fisheries. This is due primarily to the absence of the common access problem that makes fisheries management difficult in countries where fish stocks are considered a common property resource available to everyone. The new fisheries law was adopted by the legislature in September, 1996 and provides the much needed reforms in the original law adopted in 1936. It provides the Ministry with greater flexibility in managing fishery resources and has greatly increased fines and the enforcement capabilities of the Ministry.

While government in Cuba remains highly centralized, one of the outcomes of the UNCED process is a commitment to decentralize authority and to provide greater responsibility to authorities at the provincial level. This commitment, which is clearly expressed by the many initiatives of provincial government in the S-E ecosystem and the many new initiatives outlined above, places Cuba in an outstanding position to play a pioneer role in progress towards sustainable forms of development. Cuba's institutions are therefore well positioned to implement the S-E ecosystem strategy.

5.2 Scope and Content of the Strategy

At the time of the site visit conducted for this evaluation, the S-C strategy existed as a voluminous draft final report and an Executive Summary. The report was organized as follows:

- Summary and Introduction (19 pp)
- Four chapters of "Findings and Recommendations" organized by topics addressed by the working groups (99 pp)
- A chapter on strategies (62 pp)
- A chapter that presents the Strategic Plan as a series of lists summarizing each of the sections of the preceding chapter (28 pp)

- A final chapter that reduces the lists in the preceding chapter to those actions which are believed to be most important and should be undertaken during the next phase of the GEF Project. This chapter is presented as a 19-page table.

The organization of this document is cumbersome and the result is a lengthy, frequently repetitive, document that does not do justice to the research, planning and policy reform that has occurred during the life of the project. The absence of an issue-driven structure to this strategy results in many pages of description that have no clear link to the recommended policies and the proposed actions that together make up the strategy. Since the same level of detail is applied to all topics irrespective of their importance or complexity, the result is a large but unfocused document that lacks the “hard edges” that the project is currently in a position to build into its strategy. The problem lies not in the quality of the information presented or in the analysis of its implications and what needs to be done. The project has made remarkable progress in two and one-half years on both counts.

An organization constructed around a short list of priority management issues would provide a more effective basis for an initial phase of implementation and a second phase GEF Project. In the opinion of the evaluation team, the descriptive information and the baseline trend analysis that they contain would be more usefully compiled into a series of annexes to a short and focused strategy. It would be important that such annexes be prepared and presented as an initial analysis and as a baseline (rather than descriptive text) from which future trends in ecosystem condition and use can be measured, and adjustment to management strategies can be made.

The table of priority actions contains 62 individual entries. Because of the style of presentation, the major accomplishments of the project, and its most significant recommendations, do not readily present themselves to a reviewer. These accomplishments and recommendations are, however, very significant and include the following:

- An ambitious field program now provides extensive surveys of the archipelago’s biodiversity. Areas of particular importance and where intensive surveys should be made in the future have been identified.
- Degraded habitats, including previously undocumented areas of severe eutrophication and mortality of seagrass beds, have been mapped and the sources of the pollution (primarily sugar refineries) have been identified.
- Species and habitats requiring restoration have been identified and the most promising strategies for their recuperation have been identified and in some cases are already being tested.
- Many actions have been taken (see Section 4.8) to halt activities that threaten important species and habitat.

- The entire archipelago has been mapped and a generalized zoning scheme has been applied to identify sensitive areas and delineate protected areas where development should be prohibited.
- Proposals for marine parks and fisheries reserves have been formally submitted to the appropriate Ministries and are currently being evaluated.
- Those areas under most intense development pressure as tourism resorts have been identified and intensive mapping and planning has been completed. These detailed site plans have already had a major impact on the form of development that will be permitted in the key areas.
- Construction practices have been significantly altered so that causeways no longer cut off circulation within lagoons, site disturbance is kept to a minimum at construction sites, and the style of tourism facilities and infrastructure is much more in keeping with an area that hopes to market itself as environmentally sensitive and rich in ecotourism opportunities.
- Great progress has been made in promoting more effective collaboration between the scientific community and those responsible for development in the archipelago. These consultative and new approaches to planning are having an impact well beyond the S-C ecosystem.

Stephen Olsen made a brief second visit to Cuba in September. By that time the project staff had responded to the suggestions made on reformatting the strategy and a new rendering of the shorter version was discussed. This is a considerable improvement and presents a much clearer statement of the issues and actions that would indeed lead towards sustainable development of the S-C ecosystem and to the protection of its extraordinary biodiversity.

6. RECOMMENDATIONS FOR ADVANCING THE PROCESS BY WHICH THE STRATEGY WAS DEVELOPED

The project team has done an outstanding job in completing all objectives, actions and activities as set forth by the 1993 Project Document. This is a remarkable accomplishment. The quality of the work has been excellent and on the basis of this alone a second phase GEF Project as initially envisioned should be undertaken.

6.1 Readiness for an Initial Phase of Strategy Implementation

According to the GESAMP methodology for achieving a coastal management program, the GEF Project has completed all the major actions of Steps 1 and 2 and is at the threshold of formal endorsement of a strategy and an initial stage of implementation (Steps 3 and 4).

The evaluation team strongly recommends that a second phase of this project be undertaken as initially contemplated during the project formulation process in 1992 and 1993. The design of a second phase must reflect the changes that have occurred within the Cuban institutional context since 1993, and the current understanding of the threats to the biodiversity of the S-C ecosystem. A second phase could pay greater attention to the contributions of this area to biodiversity conservation in the greater Caribbean region and to greater collaboration among those working to preserve biodiversity and promote sustainable forms of development within the region. The following recommendations begin by identifying actions that relate directly to the fundamental GEF goal of biodiversity conservation.

- (1) A scientific basis should be developed for assessing the role of the S-C ecosystem in regional ecosystem processes affecting biodiversity in the Caribbean. Prevailing currents and the distribution of indicator species suggest that the S-C ecosystem is likely to be a major source of the eggs and larvae that sustain coral reefs and fisheries in Florida and the Bahamas. The S-C ecosystem is also important to many species of migrating birds and includes nesting habitat for several important species, most notably the greater flamingo. The presence of the Cayo Coco Ecosystem Research Center makes it feasible to undertake the research required to estimate the significance of the S-C ecosystem in maintaining biodiversity in the Caribbean region.
- (2) The extensive biodiversity surveys undertaken during Phase One provide the basis for more intensive biodiversity studies and permanent data sets that document the high biodiversity and endemic life that is known to be present. During a second phase biodiversity reference collections should be consolidated and strengthened.

- (3) A Phase Two project should strengthen the tradition of “citizen science” that is already present in Cuba. Local museums and amateur naturalists’ organizations can and should play a strong role in biodiversity documentation and monitoring and can refine techniques that could be applied elsewhere in the Caribbean.
- (4) Project activities in the mainland portion of the S-C ecosystem should be limited to sites of known importance of biodiversity and to priority sources of stress to the internal waters and the islands of the archipelago. Of top priority here are actions that will reduce the organic loadings from sugar refineries that have produced anoxic conditions and are degrading seagrass beds and coral reefs. Another major concern is the reduction in fresh water flow to the lagoons brought by the construction of dams within the watershed.
- (5) Information systems need to be developed by a full range of institutions that more forcefully promote direct electronic access to standardized databases and its multivariate analysis for resource management and conservation.
- (6) A major feature of Phase Two should be the formalization and implementation of the major resource management policies and tools recommended by the Regional Strategic Plan. A top priority is to analyze how such a process of formalization and adoption can best occur within the rapidly evolving context of environmental management in Cuba. Careful attention must be given to securing stable financing for the sustained implementation of such policies and practices.
- (7) The lessons emerging from this GEF project should be applied to the protection of biodiversity in other areas of Cuba. Areas such as the archipelago of the Jardines de la Reina and the Canarreos archipelago, which are known to contain significant biodiversity resources, should be the targets for an outreach effort within Cuba that features:
 - Public education
 - University education programs including thesis projects and teaching case studies
 - Study tours
 - Training in environmental planning techniques
 - The coastal planning process
- (8) A second phase should similarly promote and participate in collaboration and exchange within the Caribbean region. Regional outreach could feature:
 - Sharing experience in the application of management tools to protect biodiversity and sustainable forms of development.
 - Promoting techniques for biodiversity documentation and monitoring.

- Formulating and testing of best practices for those forms of development that most directly affect biodiversity, particularly tourism.

6.2 Financing Issues

The Government of Cuba has already made major investments in tourism facilities and the required supporting infrastructure in the archipelago. This infrastructure includes an expanding road network, an airport, aqueducts that bring in fresh water from the mainland and the Cayo Coco Ecosystem Research Center. The magnitude of these investments raises issues about the economic viability and sustainability of tourism in the archipelago. These issues should be addressed in a Phase 2 project. The evaluation team noted that several participants in the project observed that the techniques of ecological economics need to be applied to the region; this indeed may prove useful. Traditional analyses of the economic viability of tourism investments would also be useful. Willingness to pay for studies could assist the Government of Cuba in assessing what forms of tourism are most likely to be cost effective and sustainable. Cuban law allows 30 to 40 percent of the entrance fees to parks and similar facilities be used to maintain those facilities. This is a potentially important means for recovering the high costs associated with quality tourism in the archipelago.

7. SOME LESSONS LEARNED

A number of themes came up repeatedly during this evaluation as those involved reflected on the impacts of this GEF project and what had been learned individually and collectively. The great majority of those who participated through the 11 working groups are educated as natural scientists and many of the lessons learned are therefore reflections on the role of the sciences in a public policy process.

- Integrated coastal management is informed but is not driven by science. This fundamental realization came as a surprise to some participants for whom this project was an initial exposure to the process of formulating a resource management strategy.
- For many participants this project offered the first opportunity to participate in a cross-sectoral planning process and to experience a methodology for proceeding from information synthesis to problem definition and selection of a management strategy.
- As the project matured, it became clear that new institutional frameworks with supporting policies and regulations would be required to successfully implement the S-C management strategy. This makes this project a first opportunity to apply the policy reforms that are being designed in response to UNCED's Agenda 21 to a specific geographic site and a specific set of management issues.
- Several participants reflected that this project strongly reinforced that public education and public engagement must be at the core of an initial phase implementation.
- Finally, the participants in the project have become very aware that the issues posed by biodiversity, conservation and sustainable development in the S-C ecosystem will be successfully met only through a sustained effort extending out over many years.

8. REFERENCES

GESAMP (IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection) (1996). *The Contributions of Science to Integrated Coastal Management*, GESAMP Reports and Studies No. 51, FAO, Rome, 66 pp.

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