

Tropical Coasts

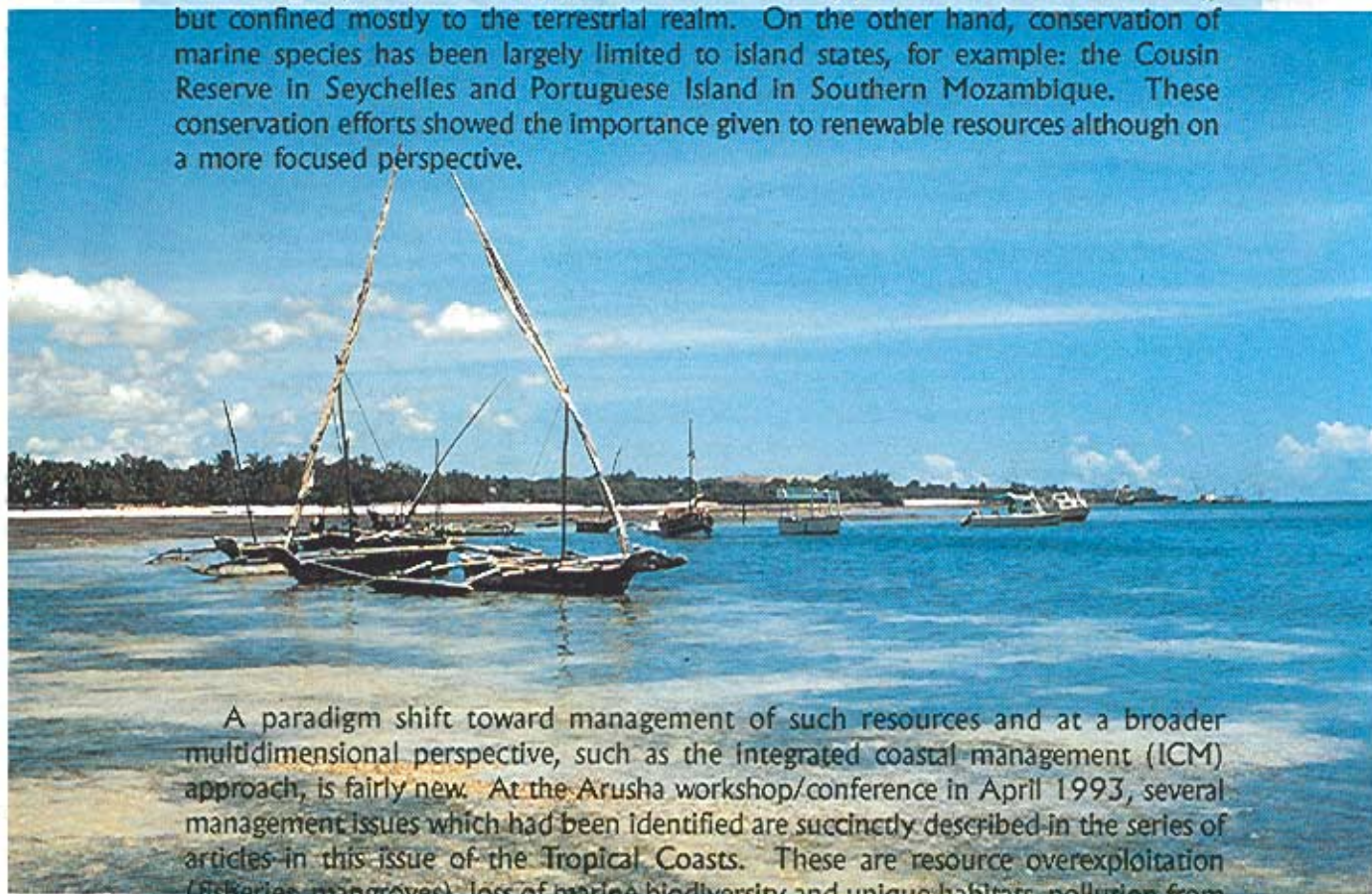
A newsletter for policymakers, environmental managers, scientists and resource users.

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Conservation to Management - Initiatives for the Coastal Zones in Eastern Africa

Olduvai Gorge... Kilimanjaro... Serengeti... Ngorongoro Crater!

These places evoke stirring visions and wonders from our deep time beginnings to the majestic panorama of nature's biodiversity. Conservation in Africa, both cultural and biological, has been widely practiced since the early part of the Twentieth Century, but confined mostly to the terrestrial realm. On the other hand, conservation of marine species has been largely limited to island states, for example: the Cousin Reserve in Seychelles and Portuguese Island in Southern Mozambique. These conservation efforts showed the importance given to renewable resources although on a more focused perspective.



A paradigm shift toward management of such resources and at a broader multidimensional perspective, such as the integrated coastal management (ICM) approach, is fairly new. At the Arusha workshop/conference in April 1993, several management issues which had been identified are succinctly described in the series of articles in this issue of the *Tropical Coasts*. These are resource overexploitation (fisheries, mangroves), loss of marine biodiversity and unique habitats, pollution from maritime activities, agricultural runoffs (pesticides, nutrients), wastes from population centers and industries, coastal erosion, sedimentation, and legal and institutional constraints. Some of these problems are compounded by changes in political regimes, widespread social and economic disparities, and lack of reliable baseline information.

(continued on page 21)

Integrated coastal management (ICM) has been widely promoted in many parts of the world even before the Earth Summit, with varying degrees of progress and success. In the recently concluded International Workshop on ICM held in Xiamen, China, last 24 - 28 May 1996, ICM was deemed to represent a viable and proven alternative to traditional methods of planning and management in the coastal zone. It is a dynamic process and requires sufficient time to mature and expand according to the institutional capacity and the complexity of the issues being addressed within an identified management area.

In general, ICM is an emerging paradigm in the African continent; but some countries have made significant headway, especially in Eastern Africa. Since the 1993 Arusha conference which issued forth the *Arusha Resolution on Coastal Zone Management in Eastern Africa including the Island States*, ICM has become a catalyst in mobilizing political efforts toward the sustainable utilization of coastal resources, as well as regional cooperation among concerned countries. As a matter of fact, a ministerial conference on ICM will be held in Seychelles on 23 - 25 October 1996, and, as we understand it, will be participated in by His Majesty Carl XVI Gustaf of Sweden.

This fourth issue of the **Tropical Coasts** focuses on ICM and related initiatives in Africa, especially in Eastern Africa. Renewable and nonrenewable resources in the coastal zone of the African States have been heavily exploited, resulting in myriad economic, social, and environmental problems. While biological conservation activities have been undertaken for many years (both coastal and terrestrial), an integrated approach to managing the resources is relatively new. Some of the articles covered in this issue described many problems that are common to coastal zones in developing countries worldwide, such as the burgeoning population pressure on scarce resources, environmental degradation due to pollution and unbridled development, inadequate institutional and legal arrangements, among others. The genesis and severity of the problems vary, however, and for some countries in the region, exacerbated by political volatility, widespread economical and social marginalization, and lack of reliable baseline information. Efforts are being exerted to alleviate many of the socioeconomic problems facing the African coastal zones with technical and financial assistance from international agencies like Sida, UNEP, IDRC, World Bank, and UNDP, including the debt for conservation conversion by IUCN. Management plans (e.g., ecotourism, mangroves) have also been formulated for some countries; but implementation has been problematic. Too often, financial assistance stopped short of implementation and most of the activities in ICM initiatives have been centered on planning and research. Moreover, ICM is seen by donor agencies and governments as projects and very limited attempts to integrate the system into the mainstream government activities have been made. It is, therefore, high time that donor agencies should direct their efforts on implementation and not just on issue identification, planning, and research. Likewise, the coming ministerial conference in Seychelles should put more emphasis on ICM implementation and the strengthening of institutional and legal arrangements, as well as on financial sustainability. Given the novelty of the integrated approach, impediments toward implementation are not unusual and should be treated as a learning experience. However, comprehensive efforts must be made to minimize such impediments, including capacity-building at the local level, public awareness, and participation. Furthermore, South-South cooperation as with some countries in East Asia where ICM activities are relatively advanced could enhance ICM efforts in Africa through training and technical assistance.



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INTEGRATED COASTAL ZONE MANAGEMENT INITIATIVES AND PROGRESS IN KENYA

Research in coastal resources seldom addresses the local communities' needs within a holistic and integrated framework which contributes to poor management and weak governance. Various follow-up activities have taken place under the auspices of the Food and Agriculture Organization-United Nations Environment Programme (FAO-UNEP) program on Integrated Coastal Zone Management (ICZM), with significant support from the Swedish International Development Cooperation Agency (Sida). Although diverse regional issues were identified in the April 1993 Arusha Workshop*, the focus is now on individual country issues. Hence, different scenarios may emerge because of the differences in existing political, institutional, and infrastructure arrangements, and those related to geographical or environmental conditions.

In many developing countries, economic-driven issues play the most prominent role which oftentimes dictates the type of governance to be practiced. This article attempts to broadly categorize the ICZM issues in Kenya into: governance issues and resource exploitation-related issues although some shortcomings in the former are related to resources or activities that yield the highest economic values.

Governance Issues

The following governance issues have been observed in Kenya although these may also be true for most other developing countries in the Sub-Saharan Africa:

1. Resource governance is done in such a fragmented fashion that a given resource may fall under the jurisdiction of different authorities or institutions of different powers. Hence, resource is managed under different by-laws that inevitably generate conflicts.
2. The role of the authorities or institutions is not well-defined. Thus, there is a considerable power overlap and, in some cases, loss of authority depending on the level of bureaucracy.
3. The approach for "empire building" and "sustenance of authority" in sectors with higher economic yields may occur.
4. Good governance is ideal for managing the resources for the people; however, the management goals and

output sometimes do not yield the desired expectations (e.g., the Marine Park expansion along the Kenya coastline is generating conflicts). In fact, it is often observed that zone planning seldom considers the stakeholders' interest, particularly the local communities.



An example of a fairly pristine beach along the Kenya coast. Maintenance of its aesthetic beauty will depend on proper coastal planning.

5. There is a growing concern as to the cost-effectiveness and efficiency of the police system used by some of the developed countries in protecting natural resources. Besides being expensive, such a system generates a higher degree of animosity. There is, therefore, a need to promote the traditional resource protection practices of the local communities which can be cost-effective and make management closer to the direct beneficiaries.
6. Public awareness education as a tool for good governance is yet to be appreciated. It should be used to promote better appreciation and understanding of the need to work hand-in-hand for harmonious management and not for political grandstanding.

Resources Issues

Resources issues are the result of economic activities by various stakeholders. Such resources include the biological and nonbiological, as well as "people" with respect to employment aspects. The major activities along the coastal areas of Kenya is shown in Table 1. Tourism, maritime transport, and nonagricultural industries, such as oil refinery

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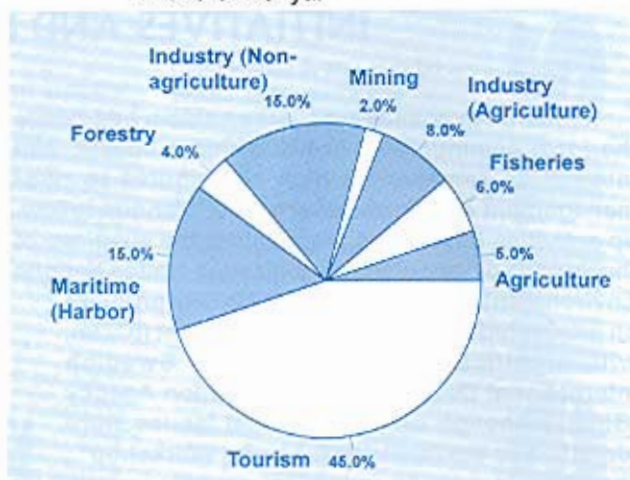
and cement industry, are among the top revenue-earners. The table also summarizes the issues associated with the various economic activities.

Their relative importance is shown in Figure 1. The top major activities (Figures 2 and 3) offer more formal taxable employment opportunities than the rest. Within each activity, more employment opportunities exist for the local residents than for foreigners (non-Kenyans), even for the top major activities where foreign investments are the highest. The foreign investments may be done directly by private entrepreneurs or through government bilateral or multilateral programs as donor-aided projects. However, in the latter, government projects are termed local Kenyan investments even if they are donor-aided.

Urbanization Issues

The process of urbanization is rapidly taking place along the Kenyan coastline (Figure 4), with tourism activities playing the biggest catalytic role. Most of the infrastructure development are enhanced in the tourist centers. Villages like Malindi, Watamu, and Diani have now grown into urban areas due to tourism and its related activities. The infrastructure in the nontourist hinterland, although located a few kilometers from the coastline, remains relatively underdeveloped.

Figure 1. Major Economic Activities in the Coastal Areas of Kenya.



The infrastructure in urban areas encourages industrial investments, making them environmental hot spots for pollution. Urban planning for proper siting of various infrastructure facilities and utilities, i.e., roads, waste disposal and treatment systems, telephone, electricity, schools, hospitals, recreation centers, etc., is essential and has to be adhered to to minimize pollution and maintain the aesthetic values of the natural environment.

Table 1. ICZM Issues Based on the Major Economic Activities along the Kenyan Coast.

Economic Activity	Distribution along the Coastline	Development	Impacts and Uses
Tourism	Entire coastline	Rapid tourism development. Tourism is the main catalyst for infrastructure development and a major foreign-exchange earner and employer.	Degradation of the environment in marine parks and loss of biodiversity; significant employer from hotels; loss of access to beach by local communities; loss of fishing grounds, etc.; cultural pollution.
Maritime (Harbor)	Major deep creeks (Mombasa-major harbor; Lamu-minor harbor)	Mombasa is the major harbor and dredging was done to widen it. Significant foreign-exchange earner and employer.	Continued threats of oil pollution and other dangerous cargo.
Industry (Nonagricultural)	Mombasa	Appreciable growth, especially the oil refinery and cement industry.	Main threats are due to waste disposal and gas-generated emissions.
Industry (Agricultural)	Mainly at Mombasa and Kilifi	Growth of industry registered but farm produce not always sufficient to provide enough raw materials. Significant industries are cashew nut, sisal, fruit, bixa, and coconut.	Wastes generated are biodegradable but wastes in soakage pit could pollute underground water sources.
Fisheries	Entire coastline	Still basically artisanal and confined to shallow waters. Mechanized offshore fishing still underdeveloped	Increased artisanal fishing on reefs threatens biodiversity and cause overexploitation.
Agriculture	Entire coastline	Agricultural activities are still at peasant level. Commercial farms are uncommon	Poor cultivation methods are prevalent, thus encouraging soil erosion and, ultimately, pollution by sediments in the sea through rivers
Forestry	Entire coastline	Forest products are essentially from the wild. Agroforestry not significant	Loss of biodiversity. Promote replanting where possible
Mining	Sand dune areas, especially north of Malindi.	An expanding activity, in sand dune areas.	Ground water table being exposed to loss of water by evaporation.

Figure 2. Employment in Various Economic Activities.

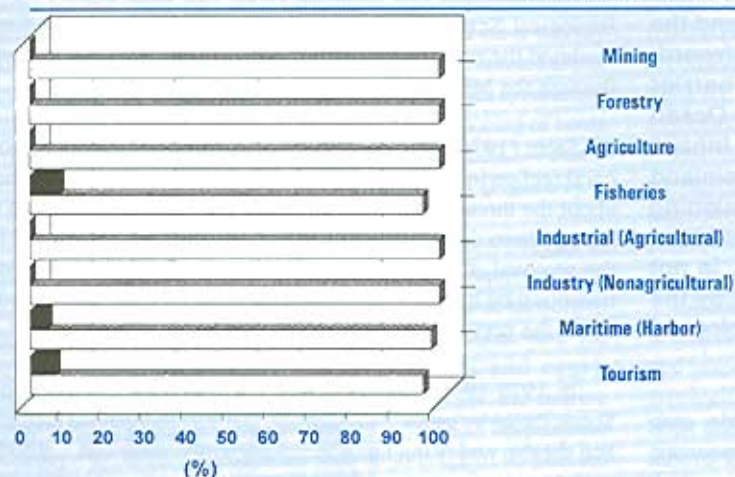
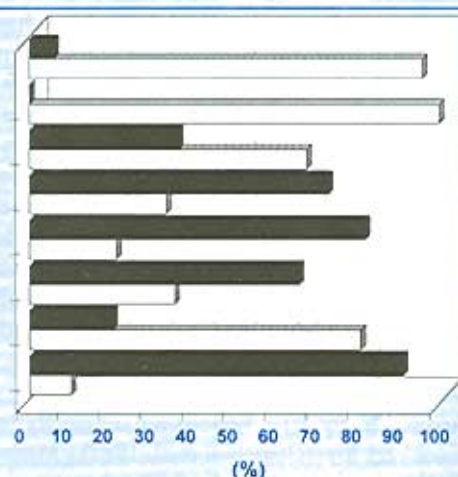


Figure 3. Comparative Levels of Investment for Residents and Foreigners.



Environmental Issues

Apart from the loss of biodiversity, another important environmental issue affecting Kenya's coastal area is beach erosion. The erosion problem has been enhanced (i.e., compounding natural shoreline erosion) by unplanned shoreline constructions, especially for tourism facilities. What clearly emerges from this situation is the need to discern the natural environmental processes and integrate them into the development plans so as to minimize the negative environmental impacts.

ICZM Progress

The success or failure of ICZM definitely depends on how its governance and resource issues are tackled. Already in place are institutions and authorities with mandates to deal directly or indirectly with the aspects of coastal resources management in Kenya. Consensus-building using the participatory approach is being practiced in the government through the District Development Committees. These committees address the needs of the people from the grass-root levels. The Kenyan government's commitment to the UNCED's Agenda 21 and the 1993 Arusha Resolution on ICZM catalyzed the need to resolve the governance issues discussed previously. A successful example is the initial attempt for institutions to come together and work on ICZM issues. This is being undertaken by five institutions with different mandates, (although some overlap). These are the Coast Development Authority, Kenya Marine and Fisheries Research Institute, Kenya Wildlife Service, Fisheries Department, and the Municipality of Mombasa. These institutions are undertaking a case study of a portion of the Kenyan coast at Bamburi, Mombasa, commissioned by the FAO, UNEP, and the University of Rhode Island. The issues identified for the Bamburi area fall within the larger domain of Kenya's major coastal issues (See Figure 1).

Figure 4. The Kenyan Coast and its Administrative Districts.



The working relationship developed by these institutions led to the design and signing of a Memorandum of Understanding to strengthen future collaborations. This will also help sensitize other institutions on the need for ICZM and, at an opportune time, to cultivate stronger political support that is required in order to get the appropriate legislation that will support ICZM activities with minimal conflicts.

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COASTAL ZONE MANAGEMENT AT INHACA AND THE PORTUGUESE ISLANDS, SOUTHERN MOZAMBIQUE

Situated in Southern Mozambique, Inhaca and the Portuguese Islands — together with the northward-trending Machangulo Peninsula — form a barrier which separates Maputo Bay from the Indian Ocean (Macnae and Kalk, 1969). The population of Inhaca Island, excluding the war refugees from the mainland who returned to their places of origin since the signing of the Peace Accord in 1992, is estimated to be about 4,700. Portuguese Island, on the other hand, is not inhabited and its resources are not exploited by the local population because it is an established biological reserve.

Because Inhaca Island's soils are inherently infertile, crop yields are very low (Campbell et al, 1988). Marine resources, therefore, represent the basis for the local population's survival, either directly as food or indirectly as source of income. Despite their fundamental importance, these resources are faced with increasing pressure, highlighting the need to adopt a management plan for their sustainable use.

The eastern shore of Inhaca Island is characterized by tall dune formations susceptible to erosion. The first attempt to stabilize these dunes was made in 1958, aimed at protecting the lighthouse located on the northern peninsula of the island (See Figure 1). The steep dune slopes along this section were successfully stabilized by the planting of *Casuarina* after attempts to use indigenous strand creepers failed (Cardoso, 1958).

In July 1965, the whole of Portuguese Island and several parts of Inhaca Island were gazetted as biological reserves by a legislative decree. The area under reserve status includes all the mangroves (except a small area in the north of Inhaca "for the use of the population"), the lagoons south of the Marine Biological Station of Inhaca (MBSI), all the coral reefs, the entire eastern beach coastline (this stretch provides habitat for two species of turtle), and part of the western coastline (See Figure 1).

Two types of reserves were created, namely: *Terrestrial Reserves*, for protecting the dune forests and soils, and for the sustainable use of fuelwood, building materials, and other forest products; and *Marine Reserves*, for protecting the coral reefs for scientific and tourism purposes and for ensuring conservation of habitat by providing a nursery and refuge for marine fauna.

In 1976, the detailed demarcation of the reserve's boundaries was finally undertaken after the Faculty of Biology (now the Department of

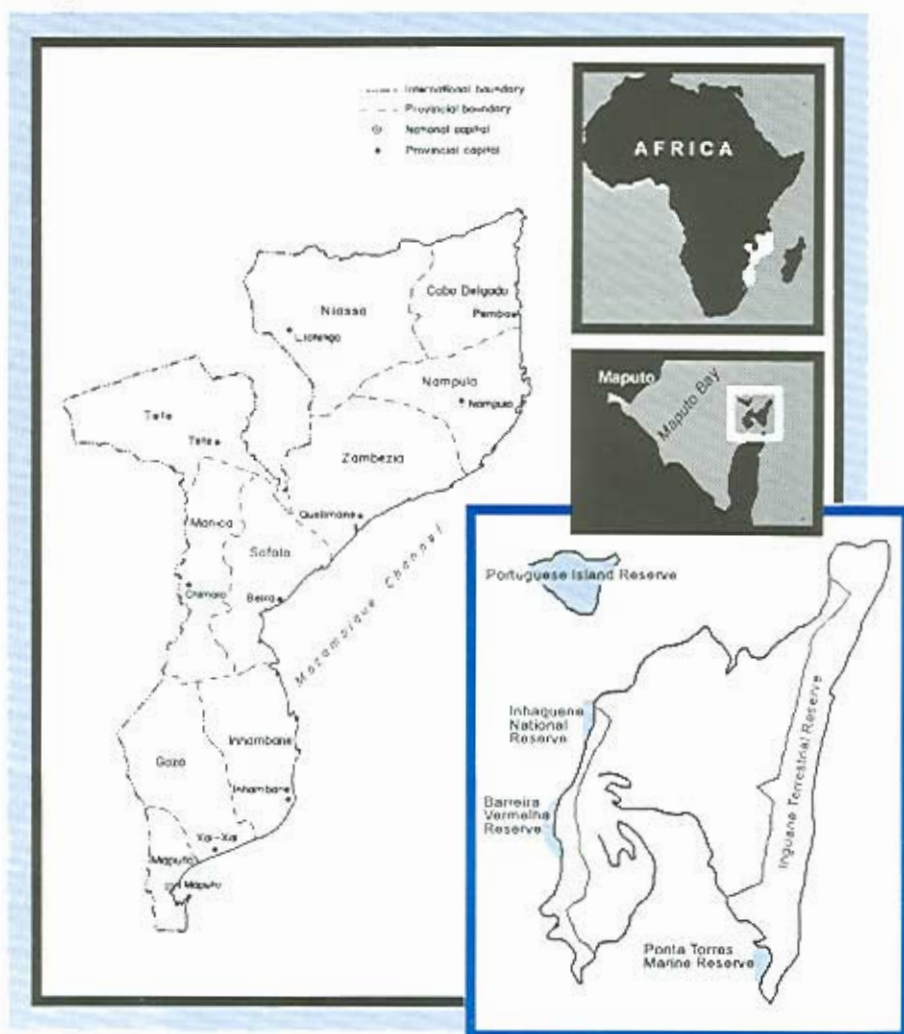
Biological Sciences) of the University of Eduardo Mondlane assumed the responsibility for the management of the reserves through the MBSI.

Salm (1976) described the dynamics of the southernmost coral reef on Inhaca Island, Ponta Torres (Figure 1), and warned about the threat to the stability of the reefs with the advance of the southern dune formation. Dune advance was promoted by the removal of dune vegetation due to grazing by goats and trampling by humans, resulting in subsequent sand movements under the prevailing southeasterly winds.

In 1977-1979, attempts were made to stabilize the Ponta Torres dunes by establishing fences, planting indigenous creepers and shrubs, and using more technologically advanced methods, such as plastic spray. Access to the dunes, subject to the stabilization treatments, was also denied.

From 1975 to 1987, the administration and management of the reserves were minimal due to financial constraints. In 1988,

Figure 1. Location of Inhaca and Portuguese Islands.



the conservation measures in the reserves were strengthened with the establishment of two permanent guard posts: one at Ponta Torres and the other at Portuguese Island. Each guard post comprises basic accommodation and a campsite for the guards. Each post has small dinghies and radio contact is maintained daily. Each guard post is resupplied on a weekly basis. Six additional guards patrol the remaining protected areas. Furthermore, the stabilization of Ponta Torres dunes is resumed and buoys for the localization of corals and the mooring of boats were placed on the three most important coral reefs — Ponta Torres, Barreira Vermelha, and Portuguese Island (Figure 1).

The populations of the loggerheads and leatherbacks in Eastern Africa are coming under increased pressure due to, among other factors, the restricted nesting areas of these two species, the high mortality in their early life stages, and the people's use of turtles for food (both meat and eggs). Consequently, the MBSI protection measures for the marine turtles' nesting grounds were established in 1988. This program has proved to be very successful, with an average of 95 percent of the nests protected per year.

The recent civil unrest and insecurity in the mainland resulted in an unexpected increase in the island's population which, in turn, brought about higher exploitation of its natural resources, including those in the reserves. The opening of the fields for cultivation, deforestation for construction and firewood, and trampling by humans also caused further dune erosion.

Due to ecological sensitivity and the potential impact from its economic activities, an Integrated Development Plan for Inhaca Island was developed in 1990 (Anon., 1990), with specific recommendations to ensure sustainable development. This plan also included recommendations for community participation in selected development projects (Hatton, 1995). Although it was completed in 1990, the Mozambican Government has not officially approved it; therefore, it has not been implemented (Hatton, 1995).

The existence of this plan has probably deterred excessive illegal tourist activities that characterized other coastal resorts, although a significant number of small-scale tourist operations have been established illegally (Hatton, 1995).

Tourists facilities presently available on Inhaca include a 110-bed hotel (Hotel Inhaca), a sports fishing operation with four five-meter boats, two campsites (within the terrestrial reserves and administered by the MBSI, located at the southern tip of the island (Ponta Torres and Portuguese island), and several small "bars" that are being constructed in a somewhat haphazard fashion in the vicinity of the main hotel (Hatton, 1995). Several pirate tourist ventures offering rustic style accommodation are currently operational, like the Coconut Village (for 50 guests), Ilha Choje, and Paraiso da ilha (each with a capacity of 28 guests), and other small unofficial camps.

The increase of uncontrolled tourism has a negative effect on the protected areas, such as the cutting of trees in the terrestrial reserves for fuelwood and building materials; significant amounts of litter (empty cans, plastic, etc.) on beaches; aquatic sports

and the movement of boats at high speed on the corals; breaking and removal of corals and coral fish; and the collection of shells for selling. In addition, the great demand for marine resources in the capital city, Maputo (which is located only 35 km from Inhaca island, with a population of around 2 million), has resulted in fish stocks depletion in the Bay close to the City. As a consequence, the marine resources in areas of increasing distance from Maputo, including Inhaca Island, have been exploited. Presently, there is an overexploitation of marine resources, such as fish and holothurians, and an increase in the transgression in the marine reserves. This overexploitation is linked to the poor socioeconomic conditions prevailing in the country as people attempt to devise alternatives for survival.

A community development center was created on the island to enable the community's full participation in decision-making and launching an environmental awareness program. However, no significant improvement in environmental management has been achieved (Hatton, 1995). One of the problems was the failure to implement the recommendations of the Integrated Development Plan. Even if a management strategy is developed for the sustainable use of the island's natural resources, the plan may still be difficult to implement due to the country's current socioeconomic situation.

Hopefully, the success in the conservation of this unique heritage will result in the closer cooperation among the involved institutions at the local and central levels. Simultaneously, these institutions (such as the MBSI, Maritime and Fishing Authorities, and Local Administration and Development Center) must be strengthened to carry out coastal zone research, management, and monitoring.

To achieve the overall goal of the sustainable use of the natural resource base of the island, there is an urgent need to strengthen the institutional linkages, the training of research and enforcement personnel, and the education of the people living in the island.

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ESTABLISHING A COASTAL AREA MANAGEMENT PROGRAM FOR KUNDUCHI, TANZANIA

Interest and discussion on marine conservation in Tanzania began in the mid-1960s, with the proposal to establish a system of marine protected areas. Until recently, these were centered solely around fisheries. Investigation on coastal resources using a holistic approach began only in 1986, when the World Conservation Union (IUCN) financed a coastal and marine resources survey for the Tanga Region. This survey was followed by the 1987 coastal resources survey for the Dar es Salaam area, supported by the Norwegian Agency for Development Cooperation (NORAD) through the National Environmental Management Council. At about the same time, the United Nations Environment Programme (UNEP) commissioned a marine and coastal environmental survey in 1987. The results and recommendations of these studies called for an urgent need to conserve marine and coastal resources and protect the environment.

The issues facing marine and coastal areas are resource depletion and environmental degradation which are caused by the lack of clear policy and management actions. The development of the Mafia Island Marine Park and the preparation of the National Management Plan for the conservation of mangroves were designed to address these problems. Currently, there are a number of programs in Tanzania which are implementing a holistic approach in the conservation of marine and coastal resources and marine biodiversity, such as the Tanga Region Integrated Coastal Management Project and the Mafia Island Marine Park.



A coralline shore in Kunduchi, Tanzania.

The Global Versus the National Scene

The aforementioned initiatives are contributing toward the improvement of the conditions of coastal communities, sustaining resource use, and protection of the environment. These initiatives also contribute toward the implementation of regional and global agreements in which Tanzania is a party.

A regional conference was held in April 1993 and the output was the **Arusha Resolution on Coastal Zone Management in Eastern Africa including the Island States**. The Arusha Resolution calls upon these countries that have not yet signed the *Nairobi Convention* and protocols on conservation and environmental protection to do so. It also urges the implementation of ICZM at the national level and calls for inter- and multidisciplinary approach to research.

Tanzania continues to play its part in implementing both the regional and global agreements. A national workshop on integrated coastal management (ICM) was held in May 1995

in Zanzibar. The outcome of this workshop was a high-level statement signed by the Principal Secretaries of the ministries responsible for marine and coastal resources management. The statement was a precursor and commitment to the development of an integrated policy to guide the management of coastal resources and the environment.

However, to move forward with the development of a national policy for ICM, there is a need to implement demonstration field activities which will enhance the policy and make it more practical. The National Environment Management Council (NEMC) aims to promote as many area-specific ICM activities as possible. One of these area-specific activities is the Kunduchi ICM Program. The process has drawn in the participation of many sectoral institutions, promoted multidisciplinary research, and enforced cooperative management. Coastal and marine resource use issues are multidimensional and multifaceted. The success in solving them can only be achieved through integrated management and this is the primary operational objective of the Kunduchi Program.

The Proposed Program

The NEMC, in collaboration with other local institutions and supported by the Swedish International Development Cooperation Agency, is preparing a program which will address the most pressing coastal and marine environmental problems in Tanzania. Its planning area is the coastal and marine areas within the jurisdiction of the Dar es Salaam Council. An appropriate pilot study area has already been selected.

Objectives and Preparatory Activities of the Program

The program objective is to strengthen the capacity of the Tanzania society and institutions to achieve sustainable utilization of coastal and marine resources.

To increase capacity, the following activities will be promoted and implemented:

- marine research;
- awareness education on coastal and marine environment;
- environmental policy and legislation, including institutional framework; and
- a coastal management plan.

The program will be implemented in two phases. The preparatory phase started in May 1995 after the signing of the contract between NEMC and the Swedish government. For the second phase, implementation is expected to start in the middle of 1996, when the program document will be submitted for funding.

1. Approach — The proposed program follows the participatory approach in which the stakeholders participate from the early planning stages. All the stakeholders are involved in identifying, analyzing, and proposing the program activities. Essentially, a bottom-up approach is followed which ensures transparency and an open flow of information.

NEMC is the implementing agency of the program and a task force team is formed whose duties are to plan,

coordinate, monitor, and oversee the preparatory phase activities. The task force is assisted by a program secretary who is responsible for the day-to-day management of the program.

The following four working groups were established to work on one of the program objectives:

1. Institutional framework, including policies and legislation
2. Research — ecological and marine environment issues
3. Awareness — ecological and institutions
4. Resource usage and conflicts.

For each group, four experts were identified to work on the assigned topic.

2. Inception Meeting — The inception meeting was held in June 1995. The objective of this meeting was to bring together the stakeholders and interested parties to discuss the program concept, objectives, and expected outputs.

3. Awareness Workshops — Three workshops were held in July 1995. They were very successful in terms of attendance and participation. A total of 250 people participated actively in these workshops. The major objectives of the three workshops were:

- to provide a forum for the stakeholders to present their issues, problems, and concerns related to the development in the proposed project area, focusing on the degrading coastal and marine environment and resources use conflicts;

- to identify and prioritize issues which the task force and working groups should further study and include in the proposed program; and

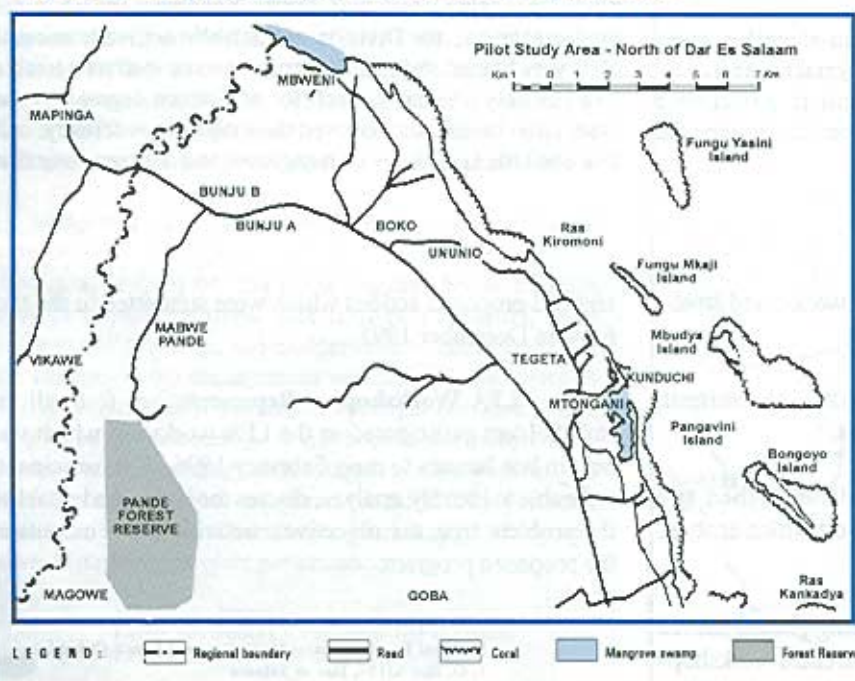
- to lay down the foundation for the Logical Framework Analysis (LFA) workshop.

The three awareness workshops were arranged as follows:

First workshop — aimed at local communities in the proposed area, such as villagers, fishermen, ward, and divisional secretaries.

Second workshop — targeted at the business community, with

Figure 1. Proposed Marine Environment Program Area.



COASTAL MANAGEMENT CASE STUDIES IN TANZANIA: MANGROVE MANAGEMENT EXPERIENCES

Coastal communities in Tanzania are dependent on mangrove for firewood, materials for construction of houses, fences, fish traps, boat-building, and for medicine even if they have the status of reserves. Tanzania's prawn fishery, an important foreign-exchange earner, is also closely linked with the mangrove ecosystems as well as the artisanal fisheries. However, overutilization by commercial pole traders, a burgeoning coastal population, and other factors posed a serious threat to the mangrove's sustainability.

The Forest and Beekeeping Division of the Ministry of Natural Resources and Tourism manages Tanzania's mangroves. However, for many years now, there has been insufficient attention given to their biological aspects and management. The result was little appreciation on the complexity and importance of this resource. Instead, emphasis was placed on the harvesting for poles and not on their essential role in supplying the basic needs of coastal communities or their vital contribution to fisheries. Because the mangrove forest reserves and adjacent marine habitats are sites of potential resource-use conflicts and are influenced by activities outside the reserve boundaries, their management must involve intersectoral coordination and the participation of the coastal communities.

In 1989-1991, the Norwegian Agency for Development Cooperation (NORAD) financed the preparation and production of Tanzania's mangrove management plan. The plan was based on the extensive field work in mangrove areas and surrounding communities dependent on them. Aerial photography, especially commissioned as part of the study, enabled the assessment of their status in mainland Tanzania. The socioeconomic factors were incorporated and their benefits — both direct and indirect — were analyzed thoroughly. The preparation of the plan took two years, involving numerous consultations at various levels from villages, districts, regions to the policymakers, including scientists from various regions. Participants in a mangrove planning workshop provided ideas and helped to structure the plan.

representatives from existing hotels, salt works, and small-scale entrepreneurs.

Third workshop — trained on the central government, regional and city councils, and institutions.

From these workshops, the program established and received good political and people's support which enabled it to work in a conducive environment.

4. Working Groups — The working groups started analyzing the issues raised during the awareness workshops

A multidisciplinary approach has been adopted and the mangroves have been classified according to their various uses, instead of emphasizing wood products alone, as was done in the past.

Zone I: Forests which will receive total protection.

Zone II: Forests which will be put under production. These are ecologically stable areas with sufficient regeneration potential to permit controlled harvesting.

Zone III: Degraded areas which will be closed from cutting for periods of varying lengths to allow recovery and rehabilitation.

Zone IV: Areas which will be set aside for development of different types.

The plan provides background information on Tanzania's coastal areas, social and economic aspects of the coastal residents and users, and coastal land use problems. After the completion of the plan, a detailed document was prepared for funding as the country had limited financial resources and had not laid down a mechanism for managing the mangroves.

In 1994, funds for implementing the management plan was secured from NORAD. However, several weaknesses were experienced in implementing the plan. One major weakness was the shortage of trained manpower. When the plan was being formulated, the Forest Division had only two people knowledgeable on mangroves. And the Division had not prepared itself in terms of staff recruitment and training for the mangroves' field management. And so, when the management plan was completed and funds became available for implementation, the Division was actually not ready because of its very limited staff. It recruited two more staff for a total of four but only one had a Bachelor of Science degree and the other three having just received their diploma in forestry. All four had little knowledge on mangroves and this was their first

and had proposed actions which were submitted to the task force in December 1995.

5. LFA Workshop — Representatives from all the stakeholders participated in the LFA workshop which was held in late January to early February 1996. The participants were able to identify, analyze, discuss the issues, and establish the problem tree, the objectives, activities, and outputs of the proposed program.

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employment. They did not have any experience in field work and they were posted to the Rufiji Delta, the largest mangrove area in the country. There was no senior staff who could provide them with in-service training. In addition, they were not given the proper job descriptions. Finally, since there were no field facilities, they stayed in the field for about two years doing almost nothing. Although the management plan was ready in 1991, its implementation started only in late 1994 after another senior forest officer was recruited as head of the mangrove management section. However, since this officer had no experience in mangroves, very little field work was done. As a result, illegal mangrove cutting still took place in many areas. Many activities stated in the plan were not implemented, e.g., the role of villagers; research to enhance knowledge, except for the mangrove restoration trials which started last year in Pangani and Rufiji; and training of personnel, which was limited to swimming. The plan should be widely disseminated to all major villages and communities. The management planning exercise has no doubt raised the awareness on the importance of mangroves' geographical extent to many people. For example, most small stands within Dar es Salaam's Selander bridge area are being converted to housing construction. However, due to the awareness of its importance, the residents have succeeded in stopping an illegal allocation of plots within the mangrove area by writing a joint letter to the authorities. The experience of the mangrove planning process will definitely contribute to the ICZM in the country. Although it is very essential for resource management, the plan cannot stop the people from indiscriminate cutting of the mangroves unless there are dedicated and knowledgeable enforcers along with the local people. And as long as the Forest Division does not have sufficient personnel for patrolling, supervision of wood cutters, etc., as recommended in the plan, mismanagement of mangroves will likely continue.

Prawn farming is not yet established in Tanzania; but there are several individuals applying for this, majority of whom are foreigners. The establishment and operation of prawn farms are the jurisdiction of the District Council and Land Department. The modification of coastal lands (e.g., illegal clearing, cutting, and destruction), especially in and near the mangrove areas, will occur. As some of these areas will fall under the Forest Division, institutional coordination must be strengthened in order to ensure proper resource management.

Manpower, rather than limited funds — as is often the case for many developing countries — within the mangrove project, appears to be the major negative factor affecting project implementation. The limited personnel, their inadequate knowledge, and inexperience — compounded by the changes in top management within the Forest Division — have contributed to the project's poor performance. There is a need to conduct a workshop to formulate new implementation strategy. Backstopping from experienced people, some of whom are present locally, for a period of time (e.g., at least two months per year) may go a long way toward improving project performance.

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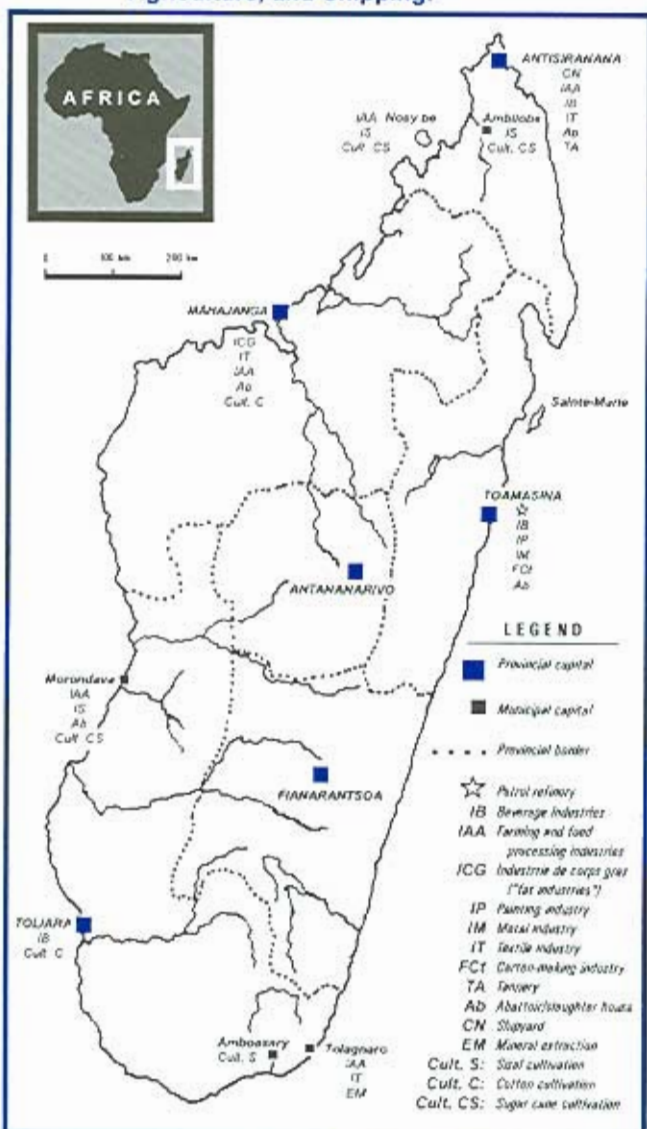
MARINE POLLUTION IN MADAGASCAR

The coastal management in Madagascar, particularly on marine pollution, is comparatively weak relative to other Eastern African countries like Tanzania, Seychelles, and Kenya. Marine pollution comes from several sources, such as domestic wastes from urban areas, industrial pollutants from industries and port activities, agricultural runoffs, and sedimentation associated with deforestation in the hinterlands. Figure 1 shows the various economic activities in Madagascar's coastal zone.

Domestic Pollution

Pollution from urban areas comes from solid and liquid wastes. According to the *Institut National de la Statistique à Madagascar*, only 17 percent of urban waste is collected

Figure 1. Economic Activities in the Coastal Zone of Madagascar are Varied and Include Industries, Agriculture, and Shipping.



through proper solid waste collection services. The rest are dumped anywhere, especially along beaches located close to the cities. This is compounded by poor sewerage systems since only 20-40 percent of the populations in large coastal cities have access to toilets. Only six out of the fifteen coastal cities have domestic wastewater collection system. There is no treatment, however, and wastewater is discharged directly into the sea. Furthermore, such a system is very run-down and serves only a few households. In general, the bulk of the uncollected wastes ends up in the sea and waterways within the cities and nearby waterbodies (e.g., lakes and marshes).

Industrial Pollution

About 40 percent of the industries in Madagascar is located in the coastal provinces. Effluents from these industries are not treated before being discharged into the sea. Madagascar does not have adequate regulatory policies on industrial waste management. Currently, the volume of industrial wastewaters being discharged into the sea is unknown. No systematic study has been conducted to determine the exact nature of pollutants in the wastewaters. Available measurements on the discharges relate to the following:

- suspended solids - 2,753.9 tonnes/year;
- nonputrefiable/decomposable and nonharmful solids - 1,078.2 tonnes/year; and
- harmful muds - 1,274 tonnes/year.

Table 1 shows the distribution of solid wastes by type of industry.

Table 1. Solid Wastes Distribution by Types of Industry.

Industry	Suspended solids (%)	Non-putrefiable/decomposable and non-harmful solids (%)	Harmful muds (%)
Farming and food processing	75.8	0.85	-
Beverage processing	11.5	-	-
Textile	9.7	48.14	-
Chemical	2.8	-	99
Metal	negligible	-	1
Electricity	0.1	-	-
Mining	-	51.01	-

Source: C.N.R.O. Report - OMS/AFRO, May 1994 (State of the Environment in Madagascar - Office national de l'environnement, 1994)

Agricultural Runoffs

The extent of water pollution associated with agricultural runoffs is not known. There are big industrial cultivations in large coastal plains, such as cotton in the south and west, sisal (*Agave sisalana*, a plant used in making twine and cordage) in the southeast, and sugar cane in the west central and northwest. These agricultural areas are drained by big watercourses and the possibility of fertilizer and pesticide contamination may be significant. However, there is as yet no quantitative evaluation of the situation to determine the extent of agricultural pollution due to inadequate sampling and analytical facilities.

Table 2. Quantity of Materials Being Shipped or Unloaded in the Major Ports of Madagascar.

Port	Year	Hydrocarbons (tonnes)	Dry Goods (tonnes)
Antsiranana	1990	32,441	135,039
	1991	not available	111,001
Mahajanga	1990	50,965	179,814
	1991	66,033	166,288
Morondava	1990	8,076	13,074
	1991	3,572	not available
Toliara	1990	12,090	71,783
	1991	11,657	44,512
Tolagnaro	1990	8,525	32,661
	1991	6,429	15,981
Toamasina	1990	409,669	864,049
	1991	not available	not available

Source: C.N.R.O. Report - OMS/AFRO, May 1994 (State of the Environment in Madagascar - Office national de l'environnement, 1994).

Pollution from Maritime and Other Activities.

Pollution associated with shipping and trading of dry goods and hydrocarbons may be significant. Like the rest of the economic activities along the coast, there are no available baseline information. However, it may be possible to infer from the quantity of materials being shipped or unloaded in several ports along Madagascar's coast, as shown in Table 2. A hydrocarbon refinery in Toamasina is discharging a great amount of wastes into the sea but again, there is no information on its wastes or their probable impacts. Inadequate legislation, monitoring facilities, and trained manpower are the main reasons for the lack of baseline information.

(continued on page 14)

COASTAL EROSION IN THE MORONDAVA REGION, MADAGASCAR

The Morondava region is located in the central part of western Madagascar, facing the Mozambique Channel. It is a low-lying and unprotected sandy lagoonal area, with an average elevation of four meters. The Morondava coast experiences severe erosion, causing the shoreline to retreat at an average of 10 meters per year. Early 19th century accounts reported of severe cases in which bordering villages had been successively devoured. At present, the hardest hit are the northern part and the beach in the south of Morondava City.

The following are the major local oceanographic conditions that have significant effects on the erosion along the Morondava coast:

- a semidiurnal tidal cycle (common to all the coasts of Madagascar), with a mean amplitude of 2.40 m, occasionally reaching 4.75 m at high water spring tides which leads to the inundation of Morondava City.
- a *houle* or swell/surge, showing two regimes:
 1. the southwesterly swell: very strong and occurs in the dry season (April to November), with amplitude range of 0.5 to 2.3 m; and
 2. the northwesterly swell: moderate and coincides with the rainy season (December to March), with an average amplitude of 0.3 m but potentially reaching 4 m during cyclones.



Concrete groins constructed along the shoreline for beach protection against swell.

- Two tidal drifts:
 1. the southwesterly drift: 9 cm/s at high tide and 25 cm/s at low tide; and
 2. the south-northwesterly drift: 14 cm/s at high tide and 27 cm/s at low tide.

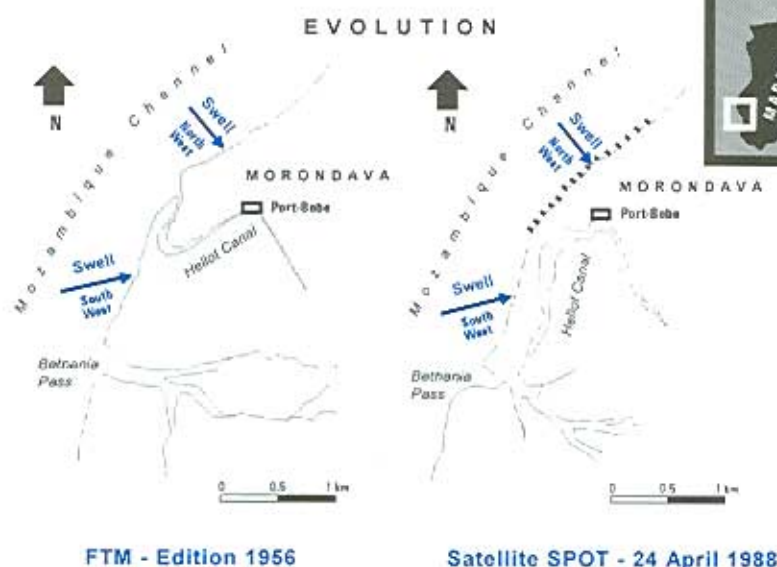
A large part of the erosion in the Morondava coast has been attributed to swell.

Impacts of Erosion

Coastal erosion attributed largely to swell has severely affected two sections of Morondava City.

Erosion in the northern part of the city is caused by the northwesterly swell. Shoreline erosion is severe in time of storms, such as in February 1953 where 100 m of beach was swept away by the sea. In 1960, cement groins were constructed perpendicular to the shoreline to serve as protection against the swell during inclement weather conditions. The erosion was contained but the city still suffered destruction. At present, all the groins are fractured and so protective measures need to be undertaken.

Figure 1. The Geomorphological Changes Along the Beach South of Morondava City Due to the Flow Diversion of the Hellot Canal.



The southwesterly swell, on the other hand, has affected the beach at the southern part of the city. The construction of the Morondava harbor has exacerbated the erosion problem. Hellot Canal is a natural channel that is being used for navigation to and from Port-Bebe. In the late 1950s, it used to flow to the southern part of the city where the deposited sediment served to

Sediment Pollution

Extensive cutting of trees in the watersheds of Madagascar has resulted in the erosion of terrigenous materials. Such situations have caused ecological disruptions in the hinterlands, threatening many of their unique wildlife not found elsewhere. In the coastal areas, sediments have caused the siltation of almost all the harbors, degradation of mangroves, and destruction of the coral reefs through smothering, especially in Toliara. In the 1950s, ocean-going vessels used to dock at the port in Mahajanga, northwest of Madagascar. At present, only fishing vessels are able to berth in this port due to heavy siltation. Some attempts at dredging silted harbors had been made but were suspended since 1983 due to lack of funds.

The serious marine pollution issues affecting the Malagasy coast require the concerted efforts of government and the active stakeholders. However, there is a need to improve the technical capacity of government agencies tasked to look after the coastal areas, particularly related to marine pollution monitoring. At the same time, there is also a need for legislative reforms, improved institutional coordination and arrangements, and adequate and sustained funding not only for rehabilitation but for the management of the coastal areas as well. Finally, there is also the need to enhance public awareness among the coastal inhabitants on managing the coastal resources on a sustainable basis, similar to that being done in the hinterlands.

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COASTAL EROSION...

(from page 13)

protect the city from the southwesterly swell. The flow of the Hellot Canal was diverted to the Bethania Pass and sediment deposition occurred much further south (See Figure 1). Because riparian sediments no longer accumulated in that part of the coast, there was an increased vulnerability to coastal erosion.

In the development of the harbor, it was apparent that no adequate environmental impact assessment had been made to determine the consequences of diverting the Hellot Canal flow. At present, studies to rehabilitate the affected areas are underway. Such studies should include the possibility of reestablishing the old course of the Hellot Canal. Despite the severe problem of coastal erosion, relocating portions of the city further inland is not possible because of economic, cultural, and historical considerations. Instead, city dwellers in the southside prefer to reinforce periodically the protective measures that have been constructed. While coastal erosion in the Morondava region is largely due to environmental factors, an integrated approach toward assessing the effectiveness of various protective measures aside from those already in place should be made, covering environmental, economic, and social aspects to ensure long-term and sustained coastal protection.

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HOW DO WE GET FROM HERE TO THERE? THE CHALLENGE OF ACHIEVING INTEGRATED COASTAL ZONE MANAGEMENT IN SEYCHELLES

Seychelles is a republic of 115 islands, located near the southwestern part of the Indian Ocean (See Table 1). Although described as a Small Island Developing State (SIDS), it is in fact one of the 63 countries with a high human development index (UNDP, 1995). Its population of 73,850 is one of the smallest among the small island states; but because of its mountainous terrain, 85 to 90 percent of its population is clustered on a narrow belt of coastal lowlands and reclaimed land, along with most of the infrastructure. The importance of its coastal zone is attributed to tourism and artisanal fisheries. These activities — so critical to Seychelles' economic and social stability — depend heavily, in turn, on the integrity of the coastal habitats.

In Seychelles, there is a general level of awareness on the need for environmental protection although an Integrated Coastal Zone Management (ICZM) approach is still lacking. Based on a SWOT (Strength-Weaknesses-Opportunities-Threats) analysis, Seychelles has achieved key successes in environmental management and has numerous opportunities on which to capitalize. Nevertheless, certain threats and weaknesses could hinder the movement toward ICZM.

Strengths

Seychelles has significant strengths on which it can establish a successful ICZM.

Distinguished Conservation History. The country has a long history of environmental protection. In 1961, the Nature Conservation Board was created which subsequently led to the protection of sea turtles, tortoises, and sea and land birds. Between 1969 and 1991, 25 protected conservation areas were created. Seychelles' involvement in international initiatives resulted in the Indian Ocean Sanctuary for whales in 1979 and the workshop in 1982 that culminated in the *Nairobi Convention*. More recently, through its Minister of Foreign Affairs, Planning, and Environment, Seychelles has been zealously supporting innovative policy efforts, such as the AOSIS and ACOPS¹. In 1991, the country's Environmental Management Plan was launched in Paris. In 1995, Seychelles hosted two internationally funded, high-level ICZM workshops. It also played a pivotal role at the 1993 Arusha Conference, leading the country to host the October 1996 Ministerial Conference on ICM.

Extensive Regulatory Framework. Seychelles has numerous existing legislation pertaining to the coastal environment, ranging from the 1907 Coast Reserves and Foreshore Leases Ordinance to the 1994 Environmental

Protection Act which, for the first time, enshrined the coastal zone as a distinct management unit. The comparative ease of drafting and enacting legislation in Seychelles seems quite extraordinary and can be a boon in coping with new and emerging areas of concern.

Substantial Budgetary Commitment. Since January 1992, the Seychelles government has provided a substantial budget of approximately US \$2 million to the Division of Environment. In addition, the new Solid Waste Collection Agency (SWAC) has been awarded a subvention of some US \$2.5 million. This affirms the government's commitment to environmental protection. The country has also benefited from abundant and diverse donor assistance, mostly through the efforts of the ministry responsible for Foreign Affairs.

Education and Awareness. There is a reasonable public awareness of environmental issues. Wildlife Clubs, established in 1993, are now thriving in some 20 schools. A public survey showed that 100 percent of those polled thought it was important to protect the areas in their natural state and 94 percent believed environmental education should be introduced in schools (Perrera, 1993). The media can be an important environmental tool since it reaches 67 percent and 87 percent of households through television and radio, respectively (MISD, 1995). The *Nation* newspaper has carried a weekly environment page since it was first initiated as *Nature Watch* by the author in February 1986.

Broad Information Base. Of importance to coastal zone management are the numerous studies and documents on coastal issues which have been produced in over 3,000 papers and documents. Hence, there is relatively a good basis for policy and management practices.

Success Stories. Seychelles has several cases of successful conservation. One of the most striking has been the Special Reserve of Cousin where, over a period of 26 years, successes in the conservation of habitat and species ranging from the once-rare Seychelles Warbler to Hawksbill turtles have been well-documented. The Reserve is one of the world's longest established example of a flourishing, self-financing mix between coastal conservation and tourism.

Weaknesses

The following are the chronic weaknesses that continue to cripple the effectiveness of the country's efforts towards ICZM.

Lack of Personnel. The attribution rate of experienced Seychellois experts in the environmental field is high. The number of Seychellois degree holders at the Division of Environment increased from 1 in 1991 to 7 in 1995. But in the same period, seven senior Seychellois staff (many of them graduates) took up jobs elsewhere. This dearth of staff who can make informed decisions, the inability to prioritize work because of ad-hoc tasks, a scattered national territory, and a surfeit of projects, all contribute to the crippling of effective and timely actions.

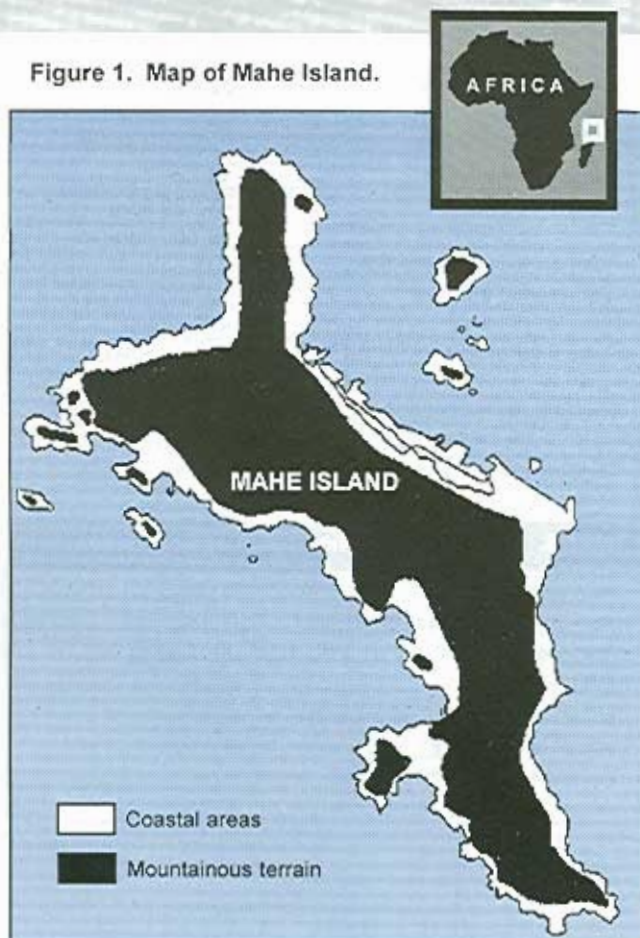
Narrow Sectoral Interests. Although Seychelles has numerous planning documents, very few are actually integrated. Government organizations are very much sectorally-based. Such a structure is an impediment to an integrated approach.

A Dearth of Stakeholder Empowerment. The stakeholder participation is paramount to ICZM's success. In Seychelles' Environmental Management Plan, the projects are to be implemented by the government. The approach has been command and control and many of the interactions between the government and the coastal stakeholders have been characterized by tensions. This is changing, but the country has inadequate experience in involving coastal stakeholders in meaningful decision-making and power-sharing.

Lack of Decision-support Systems. Many government decisions impinging on the coast are not grounded on established policy criteria or the best available scientific information. Also, there is scant information on some long-term trends. The use of the precautionary principle in cases of uncertainty is virtually unknown, while future concern would be the predictive ability on coastal erosion and climate change in general.

Poor Compliance and Enforcement. Despite numerous legislations and a high literacy level, compliance to environmental regulations is low at the local level. The

Figure 1. Map of Mahe Island.



enforcement of environmental laws has also been demonstrably poor and very few cases have ever been brought to the court. As in many small islands, kinship patterns and social familiarity complicate matters.

Opportunities

There are ample opportunities that could catalyze ICZM's establishment in the country.

Importance of the Coastal Zone. Seychelles' economy is intimately tied up with its coastal zone. Tourism is entirely coastal-based; and, needless to say, the tourism industry is dependent on coastal management and conservation for its sustainability.

Fewer Complex Problems. Seychelles is a small country with less complex problems and fewer actors in the coastal zone as compared to larger states. While coastal degradation is a significant threat, it is not as apparent as in the neighboring countries. The country has also been endowed with an outstanding natural beauty and lends itself to emotive responses for protection. Hence, many of the problems which would be difficult to solve elsewhere because of the level of complexity appear more readily tractable in Seychelles.

Stable Socioeconomic Base. Racial, religious, and tribal strifes — common in so many developing countries — are absent in Seychelles. The country is relatively stable and ranked as one with a high human development index. Communication is excellent and organizations exist to service many facets of the society. There is consequently an excellent socioeconomic base for ICZM.

Threats

An ICZM process should be initiated in Seychelles soon so that the following issue-based threats will not complicate the implementation of a timely national action.

Urbanization and Development. Rapid urbanization and general development are perhaps the most serious threat to the coastal zone. From 1960 to 1992, the urbanization rate was 2.2 percent (Table 3). Presently, 52 percent of the population lives in the urban areas, the highest percentage in Sub-Saharan Africa (UNDP, 1995). Population density is high, with 400 people/km² on the average in Mahe. The lack of flat land may compel the country to reclaim more coastal ecosystems. Many endemic species of Seychelles are range-restricted, that is, they are limited to one specific habitat or one geographical area (Table 2). Habitat loss and fragmentation are, therefore, a serious menace to the existence of these unique species. Coastal reclamation, pollution from sewage, solid waste, hazardous wastes, waste oils, sediment run-off, and pesticides can endanger biodiversity if not managed properly.

Social and Economic Threats. Since Seychelles is one of the largest per-capita consumers of fish, the management of its coastal ecosystems is very important to public health. A threat, such as *ciguatera* — a toxic fish phenomenon common in the

Pacific and the Mascarenes — goes beyond human health to economics. Seychelles' artisanal fisheries are a lucrative export (some US \$2 million in 1994), fetching high prices primarily because they are supposed to be toxin-free. Although *Gambierdiscus toxicus* and other causative agents of *ciguatera* have never been located in Seychelles, studies have shown that a certain percentage of the ciguatoxic fish sold in La Reunion are allegedly imported from Seychelles (Quod, 1990). More investigations are necessary on this matter.

Tragedy of the Commons. Open access of resources leads to the "Tragedy of the Commons" which underlies the continued overexploitation of coastal and marine resources in Seychelles. The islands are still regarded with a frontier mentality, i.e., coastal resources are boundless and can be used by just about anyone for any purpose. The attitude that the environment is a free good also leads to the use of coastal space as dumping grounds or as "pollution filters". Uncontrolled multiple use is now accentuating conflicts, especially on some beaches.

Table 1. The Geographical Setting of Seychelles.

No. of named islands and islets	115
Area of exclusive economic zone	1,374,000 sq. km.
Area of submarine banks	49,550 sq. km.
Area of fringing reefs	50.1 sq. km.*
Land area	445 sq. km.
Length of coast	599 km. 168.2 km.*
Length of beaches	59.4 km.*

Table 2. The Biological Resources of Seychelles.

Biotic communities	16
Known species	~1,139 flora ~5,500 flora
% of endemics in the flora	7 %
Threatened species	~27 flora ~60 fauna
Total area of forests	357.8 sq. km. 127.7 sq. km.*
No. of protected area	25 total 13 marine
Protected species	~30 flora 87 fauna

Table 3. The Demographic Profile of Seychelles.

Population number	73,850
Actual growth rate (1987-1994)	1.1 %
% Coastal	85 - 90 %
% Urban	52 %
Urbanization rate (1960-1992)	2.2 %
No. of households	17,461
Average population density	400 persons/sq. km. (Mahe)

LEGEND

* = Mahe, Praslin, and La Digue only.

~ = Approximate number as legislation includes marine mammals and wild birds.

Most figures valid up to 1994.

Source: ENVI.R.O. Database #1.

MANAGEMENT OF FISHERIES IN LAKE ST. LUCIA, SOUTH AFRICA

The 300-km² Lake St. Lucia, a large estuarine system, forms part of the Great St. Lucia Wetland Park in KwaZulu-Natal, South Africa. The fish resources of the estuary sustain existing wildlife (i.e., piscivorous or fish-eating birds and crocodiles) and are being exported (i.e., recreational line fishing, illicit gill netting, and as a by-catch of the Natal Parks Board's bait prawn fishery). With the increasing human demand and potential competition among resource users, a study was undertaken to assess the impacts of natural catch and predation on the fish resources and also to assist the Board members, who are custodians of the park, in the establishment of management guidelines to ensure equitable allocation and sustainable utilization of St. Lucia's fish resources.

Recreational Fishing

Trends in the anglers' catches were determined from the analyses of angling competition information and voluntary catch return data stored at the National Marine Linefish System (a large South African recreational and commercial catch and effort data base). Visitor and angler surveys were carried out to investigate some of the socioeconomic aspects of recreational fishing. Approximately 10,000 boat outings per annum were recorded at St. Lucia during 1992 and 1993, with an estimated annual catch of about 60 tons. The main species

Figure 1: The Location of Lake St. Lucia, South Africa.



Funding. From 1990 to 1994, the substantial bilateral assistance that Seychelles received fell by more than 66 percent. While multilateral aid has remained relatively stable, Seychelles' high per-capita income disqualifies it from access to many forms of overseas development assistance (MFAPE, 1995). Future funding capacity could constrain its effective ICZM efforts.

Back to the Future

New management approaches are necessary for small island states and their coastal zones because of their unique character. For ICZM to become a reality in Seychelles, the term "integrated" must be given preeminence. A paradigm shift is necessary where different sectoral interests are bridged within a multidisciplinary context. The leapfrogging to this kind of multidisciplinary high ground is contingent on the nation's ability to mobilize its institutions to overcome entrenched practices and biases. Strategies should be adopted to take advantage of social trends, such as gender-based "de-jobbing" (for part-time or project work), microenterprises (for the purpose of outsourcing), and decentralization for governance (communications).

The ultimate outcome must be the integrated and coordinated development of the coastal areas, based on agreed-upon benchmarks and measurable indicators of sustainability.

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AOSIS: Association of Small Island States.
ACOPS: Advisory Committee on the Protection of the Sea.

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captured include kob (*Argyrosomus japonicus*), spotted grunter (*Pomadourys commersonnii*), perch (*Acanthopagrus berda*), and Natal stumpnose (*Rhabdosargus sarba*). There has been a relatively little change in the catch composition in the last 20 years and angling fish abundance appears to be closely related to the lake's salinity state and the depth of the estuary mouth. Based on the simple estimates of the standing stock, present harvests seem to be within the potential sustainable yield of the system. These results suggest that, provided the natural functioning of this estuarine is maintained, the present management system for recreational angling (which includes minimum size limits, bag limits, and a large wilderness area closed to fishing) is sufficient to ensure sustained catches. Boat anglers interviewed showed a surprisingly positive response to the current angling regulations.

Illicit netting

The catches taken by illicit netting were investigated by analyzing the data collected by the Natal Parks Board during the anti-netting patrols and by negotiating with neighboring rural communities involved in netting (Mann, 1995a). Approximately 72 people from rural areas adjacent to the lake were involved in such an activity during 1992. Collectively, they owned more than 10 km of gill net and caught an estimated 90-135 tons of fish per annum. Mullet (predominantly *Mugil cephalus*) made up over 40 percent of the total catch by weight.

Illicit netting has been taking place in St. Lucia since the 1960s and although the Board has managed to discourage the large-scale commercialization of this activity, it has persisted. Unfortunately, law enforcement of this nature has resulted in antagonism between the conservation authorities and the adjacent rural communities. To resolve the problem, an experimental subsistence gill net fishery was implemented at Lake St. Lucia in 1995. This involved the issuance of 30 gill net permits to the tribal authorities from three adjacent rural areas (each permit entitled the holder to fish with 30 m of gill net). The aims of this fishery permit was to transform the unwise and illegal fishing into a controlled, sustainable use of the lake's fish resources, particularly by the rural people living adjacent to the lake. By giving the local communities the legal right to net in the lake and involving them in the control and monitoring of this fishery, the local support for conservation and sustainable resource use is expected to increase. Over time, fishermen will then develop a sense of ownership of the fish resources which they are harvesting and formulate a system of self-policing which will greatly assist the conservation authorities to transfer the responsibility for the control of the fishery to the local tribal authorities and elected fishing committees and by training community members to monitor catches.

Bait Prawn Fishery By-catch

The fish by-catch of the Board's bait prawn fishery was monitored between 1992-1993 (Mann, 1995b). The by-catch

made up an average of 5 percent of the total catch by weight. The total fish by-catch was estimated at between 578 and 1,353 kg per annum. Fish made up a significantly higher percentage of the total catch during summer than winter following the spring recruitment of juvenile marine fish into the estuary. Small, slow swimming species, such as *Leiognathus equula* and *Ambassis productus*, made up the bulk of the by-catch. Although juveniles of a number of important angling and prey fish species were caught, these were relatively low and prawn trawling in its present form is not considered to be a major threat to the fish populations in the St. Lucia system. However, in order to reduce impact on juvenile fish populations, prawn netting should be restricted to periods when prawns are abundant in the estuary.

Natural Predation

Fish consumption by natural predators in the system was quantified using published literature on the dietary requirements of piscivorous birds and crocodiles, combined with their approximate numbers in the system as determined by aerial and boat counts. Piscivorous birds and crocodiles consume an estimated 307 and 137 tons of fish, respectively, in Lake St. Lucia each year. Mugilids and *Oreochromis mossambicus* appear to be the most important prey species taken. Competition with the recreational and bait prawn fisheries is relatively low, but there is a considerable species overlap with the gill net fishery. For this reason, the mesh size of legal gill nets was set at 90-110 mm stretched mesh in an attempt to minimize competition with natural predators.



White pelicans feeding on shoals of mullet in Lake St. Lucia.

Conclusion

The fish resources of Lake St. Lucia support a large population of Nile crocodiles and a wide range of piscivorous birds (e.g., fish eagles, pelicans, herons, etc.), which are ecologically important in the system. The estuary is also a popular ecotourist area. Similarly, the good fishing in this estuarine lake brings thousands of anglers to St. Lucia each year. Sound management of the lake's fish resources is, therefore, of paramount importance to ensure the sustainable utilization and also attracts more anglers and ecotourists. Although it did not entirely eliminate illicit netting, the legalization of a limited subsistence gill net fishery in areas where tribal communities live adjacent to the lake has gone a long way towards improving the management of this important coastal ecosystem.

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ECOTOURISM TRIAL RUNS AS A TOOL FOR RESPONSIBLE COASTAL ZONE DEVELOPMENT

The ecological degradation of coastal zones the world over, particularly in tropical regions, has prompted the delimitation of numerous coastal protected areas. Recently, there has been an increasing realization that the involvement of local resource users in the process is a fundamental prerequisite to achieve success. One way of helping the local inhabitants to reap the benefits of the protected area is by facilitating their involvement in ecotourism.

For many years, ecotourism has been hailed as a potential savior of the world's last wild places and a way of sustaining local communities. It may not be appropriate for all regions; but in others, it can be a positive force in biodiversity conservation and resource preservation. The conservation agencies involved in the protected areas have been hoping that the benefit of ecotourism to the local population will be larger than the gains derived through resource exploitation. Unfortunately, ecotourism has, by and large, fallen short of its economic goals. Local communities who were promised prosperity in exchange for halting their exploitation of natural resources instead found themselves still as poor as ever and also with their traditions and social structures eroded. Too often, the benefits of ecotourism went only to a few individuals, especially foreigners, and the people who made the sacrifice of giving up their land or fishing rights were left with nothing.

The reasons behind the success or failure of ecotourism in a particular area may lie in how the development of ecotourism occurred there. Like with any other resource, ecotourism must be properly planned so that the potential socioeconomic benefits can be optimized. It must also be constantly monitored and regulated to ensure that the carrying capacity of an area or the tolerance of a local community is not exceeded. When ecotourism development occurs on an ad-hoc manner, it generally fails in its preservation aims and exacts a heavy toll on both the environment and the local communities.

When new coastal parks are declared, ecotourism development must help increase the stake of local inhabitants in the industry. Unlike most operators and land developers, their destiny is often closely linked to the health of the environment and the state of the natural resources. In this paper, a useful tool to initiate and somewhat steer the development of ecotourism in a responsible direction, namely the concept of trial runs, is being proposed. Trial runs are expeditions to developing destinations in which real tourists participate. The first runs in a series rely heavily on outside help and expertise. The involvement of local organizations and communities increases as the series of trial runs progresses. In this way, the local operators will eventually take over the tours themselves after some time and run them on a commercial basis. Only when the local inhabitants have a firm stake on the growing ecotourism market will they support the existence of the national park and marine reserves. Trial runs aim to gather information that applies to all aspects of development — from assessing the experience of the ecotourist, to evaluating at an early stage the potential impact on local communities. Trial run reports must be freely available to all sectors of the population so as to increase

their access to information relevant to ecotourism development and the opportunities associated with it.

Trial runs have the following advantages:

- New destinations can get on the man who will act as a model for subsequent developments.
- They provide in-service training for local guides in a more supportive environment that would be encountered on fully commercial trips.
- Park managers, guides, and other interested parties can become progressively more involved in the running of trial runs.
- The local inhabitants of a region have the opportunity to learn about the tourism industry, including its social and financial implications and the chance to give feedback on specific issues.

The Ecotourism in Masoala Peninsula, Madagascar

The Masoala Peninsula (Figure 1), located in the northeastern part of Madagascar, is one of the last relatively pristine areas in the country. It contains perhaps the largest remaining rainforest and has about 260 km of coastline. The Baie d' Antongil, flanking the peninsula on one side, has a high population of humpback whales in winter and is an important nursery area for fish. On the eastern side of the peninsula, long stretches of coral reefs and lagoons are found. These areas are increasingly being exploited for both the domestic and foreign fish markets. The Masoala Peninsula is unique because it is one of the few remaining places in Madagascar where virgin rainforest occurs adjacent to an undamaged coral reef system.

Until recently, tourists have visited mainly the larger towns at the extremities of the peninsula, as well as Nosy Mangabe, an island reserve. In the last two years, however, the number of tourists to the area has increased drastically because it is increasingly being targeted by outside tourism operators and business interests as a potential market. The declaration in 1995 of Madagascar's largest park, Park Masoala — that includes most of the peninsula and three marine reserves — has prompted a further proliferation of ecotourist concerns. It is, therefore, imperative that integrated conservation strategies of the region should include ecotourism development.

Ecotourism Trial Runs on the Masoala Peninsula

Prompted by the rise of uncontrolled ecotourism in the peninsula, *Eco-Africa Environmental Consultants* — the company tasked with the delimitation of the marine reserves in Park Masoala — initiated a series of ecotourism trial runs in the area.

Starting in 1993, three trial runs have been conducted.

Figure 1. The Masoala Peninsula, Madagascar.



Participants spent an average of ten days on the peninsula, most of them in areas included in the new Park Masoala and the marine reserves. Travel was by boat and walking trails. Wildlife viewing, bird watching, diving, and visits to the local villages and cultural sites were the main activities. The local involvement in the first trial run was limited to minor services. The second trial run contracted only local people to do the catering, employed three local guides, and paid site fees to traditional structures. The third trial run progressed further — the local guide association, which had not existed during the previous runs, was tasked to provide guides and logistical support on the peninsula, as well as design excursions for the tourists. Two students were employed to explain local traditions to tourists and give short talks after dinner.

Knowledge and Insights Gained from the Trial Runs

The three trial runs conducted thus far provided the following results:

- Information was gathered on the desirability of different available camping and natural sites; the relative enjoyment of specific activities, such as diving or hiking in the forest; cultural interaction with local inhabitants; local staff and organizational interaction; comparisons with other destinations within the country and other countries; and ways to improve the tours.
- Specific information was collected on the distances, the various routes, feasibility of camping sites, and logistical considerations.
- Key local people who could play a role in ecotourism development were identified.
- Specific information was collected on all financial matters, including residual revenues, such as income from handicrafts.
- Interviews were conducted with local people, such as shop owners, school teachers, and local traditional organizations about the presence of tourists, their actions, and activities.

Financial Considerations

In assessing the industry's influence on a region, it is very important to determine how and where the ecotourism money is spent. Generally, only a fraction of the money from ecotourism remains in a particular holiday area. Only if the local communities benefit directly from ecotourism will the parks and protected areas make sense to them. The larger the fraction of ecotourism money that stays behind in a target area, the easier it will be to justify the existence of the park to those people who have been denied access to such income-generating resources. Financial analyses from one trial run to the next will show where expenditures should be focused in subsequent trial runs. For this purpose, ecotourism revenue can be divided into roughly four geographical regions:

- (1) money that never reaches the host country;
- (2) money spent in the host country but away from the destination;
- (3) money spent in the broader region that hosts the target area (the protected area and its vicinity); and
- (4) money spent inside the target area itself.

The trial runs provided a useful opportunity to study how money arising from ecotourism activities was spent. For the first trial run, a boat was provided by CARE International, an NGO active in the area. Even so, seven percent of the total expenditure occurred in the host region and target area. During the second trial run, the total expenditure in the host region and target locality together came to 10.2 percent. The third trial run spent about 16.1 percent of its income in the target area alone.

A detailed analysis of these figures provides the insight necessary for steering the expenditures of trial runs toward the target area itself. Not much can be done at the moment to decrease the expenditures outside Madagascar. However, those expenditures that occur inside Madagascar but away from the host region and target locality can be reduced. Ecotourists showed that they liked to spend longer time on the Masoala Peninsula, rather than take side trips elsewhere in the country. In the next trial run, these "savings" will be directed to the host region, especially in the target area. For instance, more money can be spent on local guides and their training. In the fourth trial run, a projected 25 percent will be spent in the target area if the tour price remains the same. In reality, the tour price will rise by 18 percent bringing the real expenditures in the host region and target area to 39 percent. However, 14 percent of these expenditures is allocated for future infrastructure development.

Further Considerations

Apart from being a step-by-step approach that is both participatory and adjustable, trial runs have other advantages, in addition to those already mentioned earlier. Participating ecotourists tend to "catch the spirit" of the development initiative and the conservation ideas behind it. Many of those who participated in the Masoala Peninsula trial runs have volunteered to help in the project, both in their own countries or during subsequent trial runs. Consequently, a Friends of Masoala organization was formed. It is hoped that this organization will participate more actively in ecotourism and assist in improving the economic opportunities of the local stakeholders.

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For most of Africa, especially the Eastern African Region, their economies are primarily resource-dependent and may remain so for the near future, despite the current thrust toward industrialization. Considering that most of the coastal states in the region are dependent on the coastal resources for food, basic amenities, and foreign exchange (e.g., coastal tourism, fisheries), the management of these resources is imperative so that sustained benefits can be guaranteed. Also, there is a need to ensure that hinterland activities, especially agriculture, are being properly managed to minimize agricultural runoffs and soil erosion that could have adverse impacts on the coastal resources. Clearly then, the sustainable development of the coastal zone requires an integrated approach and such initiatives, as described in the following sections of this newsletter, have already started in most countries in Eastern Africa, including Guinea-Bissau and the Niger Delta in Western Africa. Apart from incipient ICM programs, some countries already have existing management plans (e.g., tourism and mangroves). Implementation of these plans, however, has been problematic. Among the reasons for poor plan implementation are inadequate legal (e.g., policies and regulations on resource use, enforcement) and institutional (e.g., intersectoral coordination, community participation, public awareness) arrangements, lack of trained manpower, insufficient technical facilities, and funding constraints.

As mentioned earlier, impediments to successful implementation of ICM plans are bound to happen. Therefore, sufficient efforts should be directed toward ensuring that such obstacles are addressed during the planning phase. ICM activities are often seen by governments and donor agencies as projects or programs with a definite time period. Such perception results in inadequate attention being given to plan implementation and integration into the mainstream government activities. In certain situations, plans do not get implemented because funding is limited to the planning and research phases. ICM programs and projects require time to mature, and being a dynamic process, it has to respond to changes and new developments in the management area. Thus, it is important that a "plan" for implementing the management plan should be developed, addressing possible impediments, such as intersectoral coordination, improvement or strengthening of institutional arrangements, capacity-building, community consultation/participation and public awareness, integration into ICM of relevant traditional or indigenous knowledge/practices on resource management and social interactions among users, monitoring and enforcement capabilities, among others. Also, efforts should be placed on the long-term sustainability of ICM activities through the identification and operationalization of appropriate financing mechanisms beyond project or program life. By placing sufficient emphasis on plan implementation, it can serve to check the adequacy of the planning and research phases. More importantly for the Eastern African Region where socioeconomic marginalization is prevalent, it addresses both resource management and improvement of the economic bargaining power of the coastal communities.



COASTAL MAPS FOR DECISION-MAKERS

Member states of Eastern Africa have recently launched an extensive project to produce coastal resource maps and a computer data base. The maps will be of immense benefit to various coastal stakeholders; while the data base will be useful for planners and decision-makers from various administrative institutions and specialized agencies in the region.

Scope

The Eastern African Coastal and Marine Environment Resources Data Base and Atlas (EAF/14) was established within the framework of the 1995 United Nations Environment Programme-brokered Action Plan for the Protection, Management, and Development of the Marine and Coastal Environment of the Eastern African (EAF) region. Governments of the Eastern African region — Comoros, France (La Reunion), Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, and Tanzania — are the signatories to the Convention. To date, these member states have earmarked for implementation a number of priority projects that included EAF/5 project on the Protection and Management of the Marine and Coastal areas.

The EAF/14 complements other ongoing projects in the region, particularly the EAF/4. It was initiated in June 1993 by the Oceans and Coastal Areas Programme Activity Centre (OCA/PAC), in cooperation with the Global Resource Information Data Base Programme Activity Centre (GRID/PAC-Nairobi).

Figure 1. Countries of the Eastern African Region.



The project is scheduled to run for five years — up to December 1998. The first phase of the project focused only on Kenya. Phases II and III (1995-1996) concentrated on Comoros, Mozambique, Seychelles, and Tanzania; while Phases III and IV (1996-1997) will concentrate on Madagascar, Mauritius, La Reunion, and Somalia. Phase V of the project (1998) will round up all activities at the national level into an attractive coastal resources booklet.

Atlas of Eastern African Coastline

The coastal zone of the EAF region contains valuable resources which require management and protection through proper planning. The overall aim of the EAF/14 is to provide decision-makers and the general public with a planning and management tool for developing their coastal resources. Because resource-use decisions are not easy to make, the best available planning tools must be used to organize information. Mistakes committed while planning can be costly, embarrassing, and irreversible. It is almost irresponsible to make a decision without planning. Better planning and sound decisions are made possible by the comprehensive information base provided by the data base. The atlas will lead to a wiser use of resources and help reduce wastage of nonrenewable resources.

Resource maps are portable and reliable. They appear in a user-friendly format and provide an organized graphical summary of available information. These maps indicate the areas of conflict requiring solution and provide foresight on likely consequences of specific decisions. They also indicate gaps in knowledge and information base and suggest priority areas for research. In addition, the maps act as a guide to recreational opportunities and tourist attractions. And when accompanied by a Geographical Information System (GIS) data base, these maps become even better, more efficient because it allows updating and selection analysis.

The main task of the EAF/14 project is to collate existing information on the coastal resources of the Eastern African region and summarize it in country map sheets. National coastal and marine resource maps will be printed to a scale of 1:250,000, or at a larger and more detailed scale of 1:50,000, for small-island nations and sites of paramount interest. Relevant country information will be stored in a GIS data base.

Kenya Coastal Zone Management Goes Digital

The predominantly economic activity in Kenya is coastal tourism. Tourism is the leading foreign-exchange earner of this country, surpassing tea and coffee. However, attracting tourists depends heavily on the quality of the resources and environment. Kenya's coastline has the largest extent of marine parks and reserves, covering about 20 percent of its total coastline. Also, there are important historical, cultural, and archaeological sites. Approximately 60 percent of tourism in Kenya is in the coast (e.g., in the coastal town of Malindi, about 90 percent of employment opportunities is generated). The coast is also an important center of national and regional trades, particularly through the port of Mombasa. Apart from the various coastal resources, mangroves provide food, construction materials, and significant employment for local communities.

In the first phase of the project, the Kenya Marine and Fisheries Research Institute (KMFRI) was nominated as the local lead agency for a 10-person in-country team of experts working closely with OCA-PAC. The team was drawn from the Coast Development Authority, KMFRI, Kenya Wildlife Service, and University of Nairobi.

Through this project, GRID/PAC-Nairobi has been developing GIS data base for the entire coastal zone and would be producing coastal and marine environment resource maps. In addition to its technical expertise, GRID/PAC-Nairobi will also provide the scientists and managers from Kenya and the Eastern African region with training in the various aspects related to the development and use of the GIS data bases. The experience obtained under the Kenyan activities would be

used as basis for the subsequent implementation in the remaining eight countries of the EAF region.

Once the coastal GIS data base is established and fully operational, it will be transferred to KMFRI which will be responsible for its long-term management. The data base will be updated regularly to provide the latest and up-to-date information for decision-making.

Coastal Resources

The detailed information contained in the data base map sheets includes crucial, important, and interesting parameters. Under the physical environment, the data base extensively covers the parameters on climate, hydrology, oceanography, coastal types (e.g., beaches, rocky shores, sand dunes, and mud flats). Others are geomorphology and geology, and natural hazards, such as erosion that affects developed and undeveloped areas along the coastline. For example, the maps and data base show that most of the tourist infrastructures along Diani, Bamburi, Watamu, and Lamu fall within the areas where the loss of shorefront environment has occurred. The vulnerability of the coastline against hazards (nature and man-made) will easily be appreciated when working with the data base or the atlas, making strategic interventions possible and timely such as during an oil spill.

Information on biological resources would include the important ecosystems, such as coral assemblages, mangrove systems, wetlands, estuaries, agricultural areas, and rangelands. In the data base, special focus is directed toward the protected, rare, and endangered marine and terrestrial species. Information in marine fisheries is a good example for the data base on biological resources. The information is treated under various categories, e.g., commercial fisheries, subsistence fisheries, big-game fisheries, marine fishing, etc. The location and extent of fishing methods and catch statistics are also included. Given that artisanal fishery is maintained by a complex interrelationship of the diverse flora and fauna in shallow intertidal waters, integrated approaches using the data base will facilitate the conservation and management of coastal biodiversity.

Table 1. Other Information Included in the Data Base and Maps.

OTHER INFORMATION	COVERAGE
Mineral resources	Energy (types and sources)
Tourism	Location and physical attributes
Cultural resources	Potential for tourism
Demography	Population, population density
Socioeconomic and institutional data	International converters, EEZ, waste management, EIA procedures and coastal legislation; industries; utilities (roads, ports) and marine transport

Other information in the data base is presented in Table 1.

To accompany the GIS data base and resource maps, a booklet on the resources of the coastal environment in Kenya, their uses, and management will be produced. The project will distribute about 3,000 copies of this booklet and resource maps to government ministries and departments, academic institutions, libraries, subregional and national environmental authorities, and the general public.

For planning purposes, the resource maps developed under this project will cover a corridor of about 100 kms of the coastal zone. These are expected to meet the demands of local policy-makers, administrators, planners, developers, environmental resource managers, marine ecologists, and the general public, serving as important tools for the sustainable use of coastal resources.

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TOWARDS AN INTEGRATED COASTAL ZONE MANAGEMENT IN GUINEA-BISSAU

Guinea-Bissau is a maritime West African country bordered in the north by Senegal and in the south by Guinea Conakry. The coastal areas with an elevation not exceeding 100 m are characterized by flooded plains and estuaries. There are many offshore islands which constitute the Bijagos Archipelago (See Figure 1). Although the coastal areas have the highest mangrove forest stands in West Africa, these are less diverse in terms of species.

The climate in Guinea-Bissau is tropical; the rainy season occurs from June to October, with rainfall intensity of 2,500 mm. The average temperature is 28° C (maximum 32° and minimum 17° C). The marine waters are under the influence of the Canary Current, which flows south westward into the Guinea Current and the Equatorial Countercurrent. The Canary Current brings in cold water from the temperate region and, because of its direction in relation to the earth's movement, it induces upwelling, providing an environment for high biological productivity.

Figure 1. The Geographical Location of Guinea-Bissau.



The coastal zone is crucial to the development of Guinea-Bissau. About 67 percent of the area can be described as coastal where more than 75 percent of the population resides. These proportions are very high when compared to neighboring countries like Senegal, Guinea Conakry, the Gambia, and Mauritania (See Table 1). The level of population is bound to increase significantly in the near future, considering the national growth rate of 2.4 percent. The coastal areas support most of the agricultural activities, supply mangrove products, and the marine waters are rich in fisheries resources. Guinea-Bissau has the largest continental shelf in the West African region, covering some 53,000 km². The importance of the coastal zone has been recognized by the government and has taken steps to implement coastal planning and an integrated approach to managing the coastal resources.

Fisheries Resources

The high biological productivity found along the coastal zone of Guinea-Bissau is the basis for the rich fisheries resources which are supporting the country's export market. In general, however, the development of national fisheries has not gone beyond the traditional subsistence level. Most of the fishermen are not full-time, combining both fishing and farming. This has opened up the encroachment of fishermen from neighboring countries and from the

Table 1. The Proportion of the Coastal Population and Land Area in Selected Countries in West Africa and the Status of Ratification of Regional and International Conventions.

Countries	Population ¹ (millions) 1994	Coastal Population as % of National ¹	Area km ²	Coastal Area as % of National Area ¹	MARPOL ¹	Regional Seas Convention ¹	Regional Seas Protocol ¹	Party to Convention on Biodiversity	Party to Ramsar
Guinea Conakry	6.24	21.63	245,156	10.27		R	R	P	P
Guinea-Bissau	1.09	79.82	33,101	67.52				P	P
The Gambia	0.94	53.19	11,373	36.46	R	R	R	P	
Senegal	8.12	53.82	197,863	17.72		R	R	P	P
Mauritania	2.2	10.00? (50)	1,041,970	3.77?		S	S	P	P

P = party to; R = ratified; S = signed

¹Source: Africa: A Framework for Integrated Coastal Zone Management. The World Bank. 1995

commercial foreign fishing fleets who have very little regard for the sustainability of the resources. It is estimated that the catch of these foreign fleets in the region accounts for more than half of the total catch in the region — 4 million tons (FAO, 1992).

Mangroves

More than half of Guinea-Bissau lies in the coastal zone whose elevation is critical in terms of sea level rise and storm surges. The physical functions of mangroves are crucial to the protection of coastal areas from erosion. This importance can easily be visualized against the economic costs for building shore structures for the protection of the shorelines. This has been estimated at 8.15 percent of the GNP and can be compared to Senegal — 0.65 and Gambia — 2.64 (WB, 1995). It is alarming to learn that the rate of mangrove deforestation in Guinea-Bissau is about 70 percent, the highest in Africa — a rate also experienced in Liberia, Ghana, and Kenya (WRI, 1992). The pressures on mangroves include the cutting of the trees for various purposes and clearing for salt works and for agricultural activities. Most of their functions and values, such as agents for flood control, shoreline stabilization, storm protection and wind break, biomass export, sediment and toxic retention, nutrient retention, etc., are easily overlooked because they are not obvious to the eye and the impact is felt only over a long period.

Ecotourism

The islands of the Bijagos Archipelago provide an opportunity for the development of sustainable coastal ecotourism. The marine and coastal habitats in the archipelago are still pristine. Now is the time for actions to conserve the pristine marine and coastal habitats in the archipelago.

Involvement of The World Conservation Union (IUCN)

The IUCN has been assisting in the development of a coastal and marine plan in Guinea-Bissau since 1989 when the Coastal Planning Program was initiated as an extension of the West African Wetland Program. This program is being carried out in collaboration with multisectoral national institutions, funded by the Swiss Development Cooperation. The Coastal Planning Program culminated into multifaceted activities, such as the following (Vieira and Kromer, 1994):

- **Planning**

- coastal planning;
- establishment of Mangrove National Park;
- establishment of Orango Islands National Park; and
- mangrove forestry management and legislation.

- **Fisheries** — The experimental fisheries development model on the Rio de Buba was aimed at promoting the resident fishermen's interests and strengthening their ability to manage the resources.

The program on experimental fisheries involved community participation, aimed at promoting the ownership of the fisheries resources by the coastal communities living in Rio de Buba through the granting of exclusive fishing rights to the villagers. This arrangement requires visiting fishermen to buy fishing rights from village authorities, creating a source of revenue to these impoverished communities. This mechanism increases the benefits derived from fisheries by the residents and further enhances their surveillance capabilities. The program has other components, such as the following:

- **Scientific studies** — These aim at understanding how ecosystems function, the biology of the main species, statistics concerning catches, status of the fish stocks, basic socioeconomic data, including relations among groups of fishermen. The information gathered through scientific studies is used in the development of sound management strategies, including the provision of alternative livelihoods.
- **Support for an integrated community-oriented fisheries development** — This component of the project deals with the development of mechanisms for the establishment of credits and the operation of funds to purchase fishing gears and boats and provide financial assistance to the wives of fishermen in their processing and marketing activities, as well as vegetable production. The program also intends to provide facilities for cold storage and packaging for better preservation and presentation of the fisheries products and also diversification of agricultural activities.
- **Resources management** — The program established a Coordinating Committee, with the participation of the members of the fishing profession and the fisheries administration. The committee discusses and deliberates on fisheries management and regulatory measures.
- **Training and consolidating supervision** — This component of the project aims at building the management capacities in the Ministry of Fisheries, the Center for Applied Research, and Directorate for Artisanal Fisheries.

A workshop was held to present the results of the Coastal

Planning Program which provided an opportunity for interministerial collaboration. The Prime Minister of Guinea-Bissau chaired the meeting which included five members of his cabinet. The experience on the participation of the local communities for the first time was very significant. It also enabled the government officials to see the importance of involving the communities in management.

The goal of the program's current phase is to increase the national capacity for the protection of sensitive sites, such as the Bijagos Archipelago, and for designing sustainable development models for the most important coastal and marine resources. The activities are enhanced by an environmental education component.

Debt for Conservation Conversion

Recognizing the close link between the conservation of natural resources and the macro-economic situation of the country, the government of Guinea-Bissau requested IUCN's assistance in a debt-conversion initiative. The depletion of natural resources was in part caused by foreign debt. Developing countries were heavily laden with foreign debts which have accumulated through the imbalance of trade, loans, and their earned interests. In most cases, these debts could only be paid by hard currency generated by exports of natural resources. In an attempt to catch up with the debt payments — sometimes pressed upon by the creditor countries and international financing institutions — these countries were forced to overexploit their existing natural resources, thus depriving the citizens of their benefits. This double-edged effect on the natural resources has been recognized and the debt for conservation conversion has been instituted to address this problem. Through this mechanism, the debt securities are bought by interested parties at discounts, in return for local investments into conservation activities in the indebted countries. This does not only bring relief to the economic constraints of the developing countries but also provides an incentive for improved national conservation actions.

Guinea-Bissau has benefitted from the debt for conservation conversion which has been facilitated by IUCN (Pirrot, 1995). An SFR 14 million Swiss commercial debt has been exchanged for a government commitment in cash deposit equivalent to SFR 400,000 in counterpart fund to be used and managed by the environmental NGOs for activities which promote conservation. As a result of this arrangement, the government of Guinea-Bissau has taken concrete steps toward the development of a national environmental policy which recognizes conservation needs and sustainable utilization of natural resources, such as the establishment of a network of multiple-use marine protected areas and the creation of the Bijagos Archipelago Biosphere Reserve. Furthermore, the Prime Minister's Office has officially acknowledged the role of the Coastal Planning Bureau,

established with the assistance of IUCN in 1992, as the technical unit responsible for screening coastal development projects.

Partnerships

The initiative in Guinea-Bissau has availed IUCN with an opportunity to establish partnerships with the National Institute for Study and Research (INEP). This Institute is renowned for its excellent socioeconomic studies and several of its research staff have been involved in coastal planning activities that included the development of the Integrated Plan for the Bijagos Archipelago, being implemented as a collaborative effort between INEP, IUCN, and UNDP. IUCN has also assisted INEP in the establishment of an environmental unit.

In addition, IUCN has collaborated with local NGOs, such as *Accao para o Desenvolvimento*, Tiniguena, and Allerna, as well as external institutions, e.g., *Geosystemes*, the French National Scientific Research Center, and the Canadian Center for International Studies and Cooperation.

Regional and Global Agreements

Guinea-Bissau is a contracting party to the Convention on Biological Diversity and the Ramsar Convention. However, it has not acceded to the UNEP's Regional Sea Convention for the Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region and its protocol concerning Cooperation in Combatting Pollution in Cases of Emergency (Table 1). Neither has it acceded to the IMO's Convention for the Prevention of Pollution from Ships (MARPOL).

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DEFINING AN ENVIRONMENTAL DEVELOPMENT STRATEGY FOR THE NIGER DELTA, NIGERIA

The Niger Delta, one of the world's largest wetlands, includes the largest mangrove forest in Africa. Within this extremely valuable ecosystem, oil activities are widespread — the Rivers and Delta State produce 75 percent of Nigeria's petroleum, representing over 50 percent of the national government revenues. Despite its vast oil reserves, however, the region remains poor. Per capita Gross National Product is below the national average of US \$280. An expanding poor rural and urban population has significantly affected most resource and land-use decisions in the region. Their decisions are being driven by a lack of development, poor health, stagnant agricultural productivity, very limited opportunities in urban areas, rapid population growth, and tenuous property rights. Conflicts have developed between the local communities and private and public developers over resource ownership and use, particularly tied to oil activities.

While the conflicts are getting increasing attention in the international media, a comprehensive assessment of the environmental issues in the delta and the resulting social impacts have been missing from the headlines and earlier analysis. A

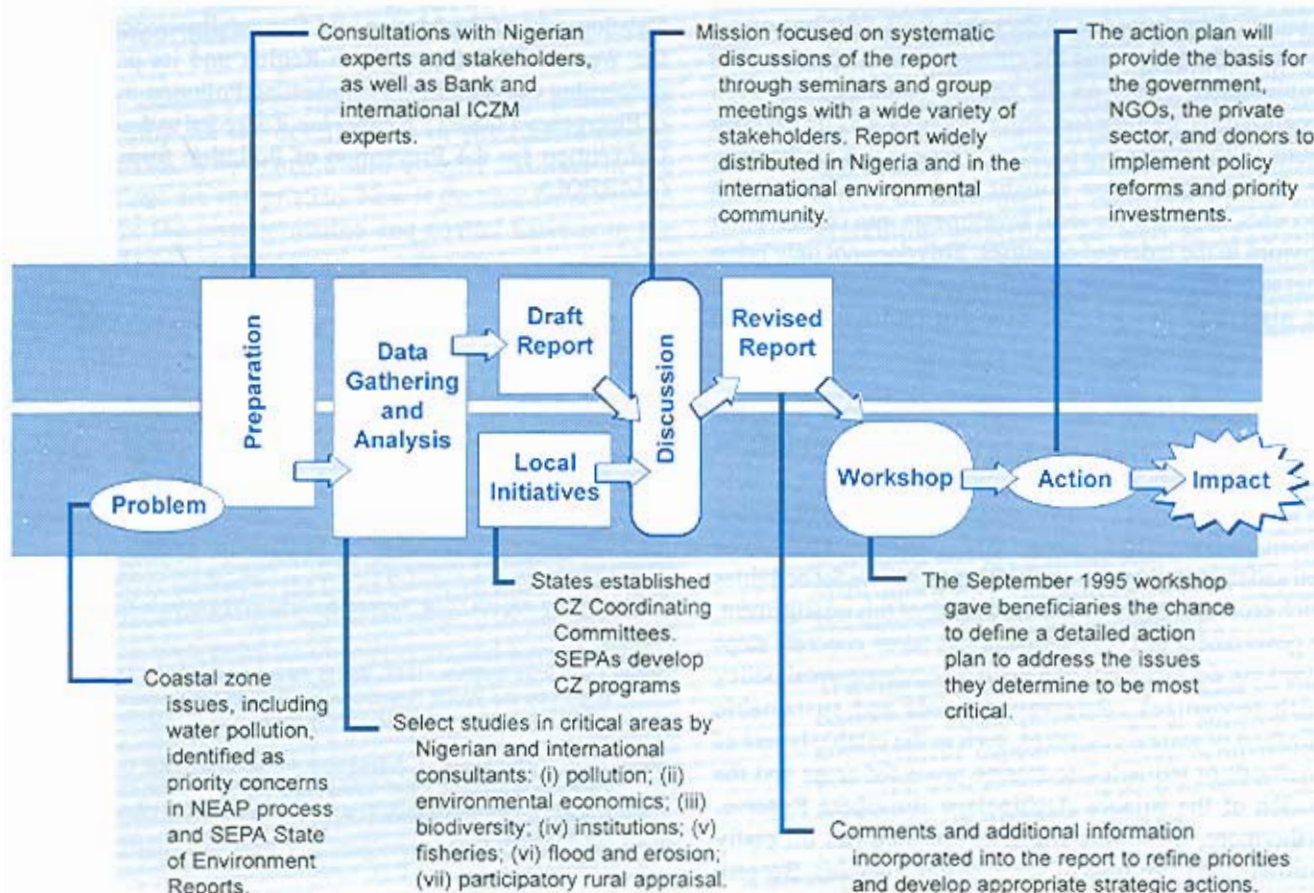
study made by the World Bank attempted to move beyond emotive arguments to provide an analytical basis for substantive stakeholder discussion of the most critical environmental and social issues and possible interventions (Singh et al, 1995). It was developed based on an innovative and highly participatory process which emphasized beneficiary consultation and collaboration to ensure local ownership. In short, the study sought to integrate sound analytical assessments of environmental problems with extensive stakeholder consultation.

Participatory Approach

The US \$25-million study was designed as an interactive process between the World Bank team and local stakeholders (See Figure 1). Support to implement the participatory program came from the Client Consultation Fund, the Nigerian Environmental Management Project, the Danish and Swedish Trust Funds, and the Global Environment Facility. The major collaborative aspects of the work are outlined below:

- Holding seminars and meetings with a wide range of Nigerian beneficiaries to understand their development goals, assessments of the problems, and existing and proposed solutions.

Figure 1. Niger Delta Coastal Zone Sector Work Process.



- Pursuing a participatory review process in the preparation of the draft report. The World Bank team discussed the findings of the draft report (Singh et al. 1995), in a series of meetings with stakeholder groups in which the report was first presented. Then, the group was given several days to prepare comments. The draft report was distributed widely in Nigeria and to international organizations.
- Engaging local consultants from the nongovernment organizations and universities to prepare studies in areas they had a clear comparative advantage.
- Working with the local office of the Federal Environmental Protection Agency to conduct an inventory and analyze sources of industrial pollution in Port Harcourt.
- Assisting the Rivers State stakeholders to establish a representative — the Coastal Zone Coordinating Committee.
- Participating on the Steering Committee of the Niger Delta Environmental Survey.
- Providing funding and helping to organize the state-level Niger Delta Coastal Zone Workshop, held in September 1995 in Port Harcourt. The workshop brought together a wide variety of local stakeholders for the first time to discuss the major environmental and social problems facing the region.

process is substantially developed in the report by comparing the potential future costs and benefits of interventions. The methodology places the highest priority on issues that have high environmental or health significance and large net intervention benefits. The prioritization process utilized in the report represents a first cut, based on the limited information available. However, it is an effective filter for determining where policy interventions can be most effectively directed, given the limited resources and institutional capacity available in the Niger Delta.

Integrating the Two Approaches: Oil Pollution - How Bad Is It?

The problems identified in the analytical approach may not always match the priorities of the potential beneficiaries. Thus, risk management requires the stakeholder's intensive participation to reach a consensus on the priority areas for interventions. For example, available scientific evidence indicates that oil pollution is not of the highest concern relative to other issues; however, this conflicts with the perceptions held by local communities. As a result, stakeholder workshop and continuing dialogue with the beneficiaries are critical for ensuring that community concerns are fully incorporated into the priority assessment process.

Most stakeholders in the region have concluded that oil companies are the major cause of environmental degradation because oil activities are highly visible and create dramatic local

Analytical Approach: Determining Environmental Priorities

To rank Niger Delta's environmental issues, an analytical framework focusing on their environmental, human health, and economic significance has been developed. The framework incorporates scientific and economic analysis to evaluate and rank the magnitude of relative risks to the environment and human health, based on the best available information (Table 1). The analysis incorporates a risk management component, which asks: "What options can be found to reduce the risks identified in the analysis?" This aspect of the prioritization



Gas flaring in the Niger Delta coast.

Table 1. Initial Ranking of Environmental Issues.

Category	High Priority	Moderate Priority	Low Priority
Land Resource Degradation	Agricultural land degradation Flooding (moderate-high)	Coastal erosion Riverbank erosion	Sea level rise
Renewable Resource Degradation	Fisheries depletion Deforestation Biodiversity loss Water hyacinth proliferation	Fisheries habitat degradation	Mangrove degradation Nipa palm expansion
Environmental Pollution	Sewage Vehicular emissions Municipal solid wastes Toxic and hazardous substances	Oil pollution Industrial effluents Industrial air emissions Industrial solid wastes	Gas flaring

ecological impacts. Many residents assign a direct cause-and-effect relationship between oil development and the declines in fisheries and agricultural productivity because both phenomena begin roughly at the same time. However, the timing may be largely coincidental and other factors, such as population growth, migration, and the construction of upstream dams are the more significant causes in the decline of productivity. Communities in the Niger Delta are frustrated that they have received very little benefits from the region's vast oil resources. The absence of oil company accountability to the local communities and very limited communication with them, combined with the inadequate compensation and social development programs, add to the unrest, which has become severe in some areas, notably Ogoniland. Since the communities obtain few benefits from oil development and are required to shoulder the environmental and social costs, it is not surprising that they have focused on oil activities as the single cause of environmental degradation to the exclusion of other factors.

Integrated Coastal Zone Management

An integrated resource management approach is required to address such a broad range of social and environmental issues to move the region towards sustainable development. Integrated coastal zone management (ICZM) is a holistic planning and coordinating process, suited to ensure that the large economic and social benefits from resources in the Niger Delta are not dissipated by destructive practices or inappropriate use. It is an ecologically and socially based approach to environmental management that is a significant departure from the traditional sectoral and technological models

which have proven their inability to deal with the complex coastal problems. To accomplish its purposes, ICZM requires several actions to be taken at the national and regional levels, including the following:

- establishment of an appropriate policy framework to support coastal resource management and environmental conservation;
- collection of data and technical information of relevance to the coastal zone;
- understanding of the resource management and environmental objectives among the various stakeholders, including local communities;
- development of an action plan to correct past environmental degradation, to modify ongoing activities that are environmentally harmful, and to establish a system for reviewing and implementing new coastal zone development projects; and
- development of an effective institutional structure to implement the action plan, to initiate future programs, and to oversee the environmental monitoring of the coastal zone on a permanent basis.

The adoption of the ICZM approach has led the Bank team to suggest a range of strategic options in key thematic areas dealing with the most critical problems for inclusion in an action plan (Table 2). The options were presented to stimulate debates

(continued on page 31)

Table 2. An Example of Strategic Options Targeting Deforestation and Loss of Biodiversity.

Options	Regional/State Level	Community Level
LEGISLATIVE REFORMS	Land and tree tenure reform Endangered habitat and ecosystem management legislation	
REGULATORY REFORMS	Sound concession and royalty programs Enforce existing regulations (including Environmental Impact Assessments or EIAs) Land-use zoning Hunting permit system and sanctions Enforce CITES	Support community resource ownership
-including economic mechanisms	Concession auctions Include conservation costs in project development.	Provide a framework for small and micro-credit mechanisms Incentives for tree planting Conservation royalties.
INSTITUTIONAL REFORMS	Capacity-building of state forestry departments: (a) improve monitoring, enforcement, and revenue collection; (b) forest management, economics, and conservation training; and (c) improve forest resource data collection and management. Improve land-use zoning capabilities of relevant agencies.	Capacity-building of NGOs and communities: (a) training in conservation and silviculture; (b) develop community monitoring, enforcement, and revenue collection programs.
DIRECT PROJECTS	Forest reserve support Smallholder timber and NTFPs programs Upgrade select reserves to higher protected area status New protected areas Alternative sustainable product development Establish buffer zones around protected areas Improve timber processing efficiency.	Agroforestry projects and programs Integrated conservation and development projects and programs Alternative sustainable production development.
EDUCATIONAL PROGRAMS	Environmental education in schools.	Conservation clubs.

DEMONSTRATION PROJECTS

• Xiamen Demonstration Project on the Application of Integrated Coastal Management

By the first half of 1996, the Xiamen Demonstration Project has fully implemented all of the activities covering legal and institutional arrangements, environmental profiling, integrated coastal management (ICM) program development, and research. The latest subprojects include the development of functional zonation scheme, pollution monitoring, and management of the Yuandang Lake and Xinglin Bay.

The coastal environmental profile and the strategic management plan, completed late last year by the Integrated Task Team, will be published by the third quarter of 1996. The management plan has been approved and adopted by the Xiamen Municipal Government as a general framework for marine environmental management. One of the recommendations of the plan was to establish an institutional mechanism to coordinate and undertake marine management in the Xiamen demonstration site. The Marine Management and Coordination Office (MMCO) was created in November 2, 1995, and has the following tasks: (1) prepare a functional zonation scheme; (2) protect and manage the marine environment around Xiamen; (3) enact local coastal and management regulations; (4) enforce the law jointly with relevant agencies to address coastal use conflicts; and (5) manage the activities covering the use of coastal resources.

Barely two months after its establishment, MMCO resolved two important issues. The first was the resolution of a long-standing dispute to transfer several net cage farms near Paitou Village in Xiamen to another site to make way for the construction of a new shipyard in line with the city's zone plan, at the same time awarding proper compensations to the affected fish farmers. The second issue concerned the conflict between marine transport and fishing. The lack of coordination between the Xiamen Fishery Administrative Office which issued fishing licenses and the Xiamen Marine Public Security Supervision Bureau responsible for maritime transportation and security resulted in the fishermen gathering eel fry to operate within ports and designated shipping lanes, blocking shipping route, hindering port operations, and endangering marine safety. The MMCO carried out several actions to strengthen coordination and streamlined management among concerned government departments, including public awareness campaigns and joint patrol and integrated law enforcement.

In another development, Xiamen played host to the **International Workshop on Integrated Coastal Management (ICM) in Tropical Development Countries: Lessons Learned from Successes and Failures**, held on May 24-28, 1996. The workshop was organized by the MPP-EAS, Coastal Management Center, and the Municipal Government of Xiamen and jointly sponsored by the Swedish International Development Agency (Sida) Marine Science Programme, Danish Cooperation for Environment and Development, the State Oceanic Administration, the Coastal Resources Center of the University of Rhode Island, and the Programme. The workshop brought together practitioners in coastal management who shared their experiences, methods, and approaches in initiating, formulating, and implementing coastal management programs in their respective countries. One output of the workshop is a document, entitled: **Enhancing the Success of Integrated Coastal Management - Good Practices in the Formulation, Design, and Implementation of ICM Initiatives**, which is a synthesis of the discussions of the workshop participants. It is presently under review and will be published in several languages. Peer-reviewed papers presented at the workshop will also be published in three issues of the journal, *Ocean and Coastal Management*.

• Batangas Bay Demonstration Project on ICM

The Batangas Bay Demonstration Project (BBDP) has undertaken a number of subprojects over the past year, including the completion of the environmental profile and the strategic environmental management plan (SEMP). Both will be published by the third quarter of 1996. Other ongoing activities include oceanographic survey, geographic information systems for ICM, socioeconomic study, waste management, and institutional strengthening. The latter is an important thrust of the BBDP for the first half of 1996, particularly the linkages with local government units of Batangas and the private sector and improving local capacity on ICM and marine pollution management.

In January this year, the Environment and Natural Resources Office (ENRO) was established by the Batangas Provincial Government as its environmental management arm. The Programme and the BBDP were instrumental in its establishment, which is provided for under the 1991 Local Government Code of the Philippines. This code deals with the devolution of many national functions to the local government units. The ENRO will eventually take over BBDP's management. Hence, local capacity-building activities, including beefing up of the technical facilities of the ENRO on pollution monitoring, are among those on the pipeline for the second half of 1996. Such a move will ensure the continuity of project activities beyond the Programme's life by integrating them into the mainstream government activities. In a related development, an ordinance has been enacted creating the Batangas Bay Council for ICM. The council



Participants to the International Workshop on ICM held in Xiamen, China on May 24-28, 1996.

is responsible for guiding and supervising the formulation, adoption, governance, implementation, and policy direction of the SEMP and related environmental action plans for the Batangas Bay Region.

On May 15-17, 1996, the project organized a workshop on **Pollution Management Appraisal** in Batangas City. The workshop provided the forum to introduce the Department of Environment and Natural Resources' (DENR) Industrial Environmental Management Project (IEMP) to the industries and local government units in Batangas. The IEMP is being funded by the United States Agency for International Development and implemented by DENR's Environmental Management Bureau. The main concern of the IEMP is on the pollution appraisal process. This process is a waste management audit system which calls for the voluntary participation of industries to minimize their generation of both hazardous and nonhazardous wastes. The goal is to have a 25 percent reduction in hazardous waste generation by the year 2000 with a 50 percent reduction on waste generation plant-wide to include nonhazardous wastes. This activity is in line with the BBDP's subproject on waste management.

• Malacca Straits Demonstration Project

The first draft of the coastal environmental profile of the Malacca Straits was completed late last year and is presently being reviewed. However, this draft largely covered Malaysia and Singapore and was prepared by Dr. Tseng Seng Keh (now with the Kuwait Institute for Scientific Research), Ms. Saara Lintu (IMO, London), and Mr. Ramanathan Natarajan (MPP-EAS). The profile's Indonesian component is now under preparation by Dr. Apriliani Soegiarto, Vice Chairman of *Lembaga Ilmu Pengetahuan Indonesia*, or LIPI. The combined final draft will be sent to all the focal points and experts of the three littoral states for review.

A major concern of the project is the potential threat of oil spill because various types of vessels, including oil tankers, traversed the Malacca Straits heavily. In recent years, a number of oil spill models have been developed, but the effectiveness of these models needs to be determined relative to the conditions prevailing in the Malacca Straits. On May 31-June 3, 1996, the Programme jointly organized the **Regional Workshop on Oil Spill Modelling** in Pusan, Republic of Korea, with the Korea Ocean Research and Development Institute and the Subcommittee for Western Pacific of the Intergovernmental Oceanographic Commission. It was cosponsored by the Korea Ministry of Science and Technology, Korea Maritime and Port Administration, Korea National Maritime Police, Pusan National Fisheries University (PNFU), Samsung Global Environment Research Center, and the MPP-EAS.



Dr. Toh Ah Cheong of the Singapore Port and Maritime Authority presents his country's experience in oil spill modelling.

As a result of the workshop, a task team was formed, composed of one expert from each of the MPP-EAS participating countries who attended the workshop and chaired by Dr. Cheong-Ro Ryu of the PNFU. The task team will develop guidelines for oil spill modelling in the region. For the Malacca Project, an action plan will be developed to identify, calibrate, validate, and apply common oil spill models in the straits which will be packaged for extension to other subregional seas.

MARINE POLLUTION MONITORING AND INFORMATION MANAGEMENT (MPMIM)

Three major activities of the MPMIM were undertaken during the first half of 1996. On March 12-15, 1996, the **Training Course on Marine Water Quality Sampling and Field Measurements** was conducted at the Do Son Marine Monitoring Station, in Haiphong, Vietnam. This was jointly sponsored by the Programme and Sida, while the local organization was provided by the Ministry of Science and Technology in Vietnam through the National Environment Agency. There were 22 participants from five local institutions. The training course followed through the efforts of the MPP-EAS to enhance the capabilities in the region on marine pollution monitoring, especially among the less developed countries. The training course, which consisted of lectures, field and laboratory exercises, specifically sought to provide the participants with a greater appreciation of the concepts and practice of seawater sampling and field measurements.

Nearly a year long effort to establish a network culminated in the **Inception Workshop on Marine Pollution Monitoring and Information Management Network**, held on April 8-10, 1996, in Metro Manila, Philippines. It was attended by representatives from 10 participating countries of the Programme. Among the topics deliberated upon were quality assurance and control for monitoring marine pollution within government agencies; intercalibration among laboratories of the network, using the Global Ocean Observation System (GOOS) Category 1 parameters; information exchange through the InterNet and electronic mail; selection of the areas where GOOS 1 parameters will be collected; and that IMO and the Programme Network will remain as the primary liaison office for its various activities.

Two sessions were conducted for the **Workshop on Integrated Environmental Impact Assessment (IEIA) for Coastal Management**, held in Metro Manila, Philippines, on March 20-22 and June 12-14, 1996, respectively. The workshop was cosponsored by the Coastal Management Center (CMC) and the Programme, in collaboration with Sida Marine Science Programme. Participants came from China, Hong Kong, Philippines, Singapore, and Thailand, including representatives from the Programme and CMC. The goal of the workshop is to prepare a curriculum for a two-week IEIA training course, including training modules on various aspects of IEIA covering historical development, methodologies, and actual case studies. Conventional EIA typically determines the impact



Dr. Gil Jacinto (second from right), Network Coordinator, explains the monitoring criteria at the opening of the Inception Workshop on Marine Pollution Monitoring and Information Management in Manila.

of one activity, regardless of whether other activities contribute to environmental degradation. On the other hand, IEIA is synergistic and based on development program for an entire area for which the geographical boundary has to be determined and all predicted impacts envisaged on a cumulative basis. The training also serves as a venue to introduce IEIA, targeting officers or administrators handling EIAs, coastal planners, consultants, and officers of development banks.

INTERNATIONAL CONVENTIONS

On March 18-19, 1996, the MPP-EAS — through its component of international conventions — conducted the **Inception Workshop on the Regional Network of Legal Experts on Marine Pollution in Metro Manila, Philippines**. It was attended by 17 participants from 10 countries. The formation of a network is part of the Programme's ongoing efforts to minimize pollution risk in the international waters through the development of the necessary legislation and technical capabilities of participating countries to implement international conventions related to marine pollution. The workshop formalized the legal network and its membership and drew up relevant activities among members in consonance with the Programme objectives.

SUSTAINABLE FINANCING

Preparations are ongoing for the **Regional Conference on Sustainable Financing Mechanisms for the Prevention and Management of Marine Pollution: Public Sector-Private Sector Partnership**, which will be held on November 14-16, 1996, at the Manila Galleria Suites, Pasig City, Metro Manila, Philippines. The conference will serve as a forum for the presentation and exchange of viewpoints and approaches to build and strengthen partnerships in marine pollution prevention and management. It will attempt to address financial sustainability through the formulation of practical mechanisms and partnerships to stimulate and sustain innovative policies, facilities, services, and practices in marine pollution prevention and management at the local and national levels.

INTERNSHIP PROGRAM

Three scientists are on internship at PDMO for a six-month period. Dr. Nguyen Minh Son from Vietnam is working on modelling of oceanographic processes, particularly in relation to oil spills. Recently, he assisted in the preparatory activities of the **Regional Workshop on Oil Spill Modelling**, as well as a participant. Meanwhile, Messrs. Ryang Choi



Dr. Antonio La Yna, Network coordinator of international conventions (IMO/PDMO) and Undersecretary for Legal Affairs of the Department of Environment and Natural Resources of the Philippines (seventh from left), formally opens the Inception Workshop on the Regional Network of Legal Experts on Marine Pollution.

and O Ryang Pyong from the DPR Korea were accepted as interns for the period March 11 to September 13, 1996. Mr. Ryang is preparing an environmental profile and a project proposal for a demonstration site in Nampo, where the integrated coastal management system will be applied. On the other hand, Mr. O was assigned the task of preparing the state of the marine environment of the country's west coast and the DPRK component of the **Directory of Institutions in Coastal Research and Management**.

The internship program is opened to the participating countries of the Programme and provides fellowships for international travel and a modest stipend per month for food, accommodations, local travel, and other expenses.

ICM TRAINING COURSE

The **Second Regional Training Course on the Application of Integrated Coastal Management System in Marine Pollution Prevention and Management** will be conducted on October 4-28, 1996, in Manila and Batangas (Philippines), Xiamen (People's Republic of China), and Singapore.

For inquiries and correspondence on the forthcoming Sustainable Financing Conference, the Internship Program, and the ICM Training Course, please write to the Programme Manager, MPP-EAS, P.O. Box 2502, Quezon City, Philippines.

DEFINING...

(from page 28)

on how to address environmental degradation, rather than to advocate specific projects and policies. Stakeholders, particularly those attending the workshop, carefully reviewed and modified the options to develop interventions which they felt will contribute most effectively to environmental management in the delta.

Next Steps

The Action Plan developed at the workshop will be presented to the State Military Administrators and the Federal Environmental Protection Agency. The following initiatives designed to communicate the major conclusions of the report to a wide range of stakeholders and to provide the basis for possible future activities are being initiated:

- continued participation on the Niger Delta Environmental Survey Steering Committee;
- preparation of integrated conservation and development

project feasibility studies and community-based technical assistance pilot projects (under the Environmental Management Project); and

- implementation of a dissemination strategy which includes: (a) widespread dissemination of the report; (b) preparation of community booklets on key issues; (c) mass media messages for reaching stakeholders throughout the region; and (d) dissemination of background papers.

David Moffat
World Bank, Washington D.C.

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FACTS AND FIGURES

ISSUE	STATEMENT	CONSENSUS
Basic Characteristics	Fundamental physics of the greenhouse effect	Virtually certain
	Added greenhouse gases add heat.	Virtually certain
	Greenhouse gases increasing because of human activity	Virtually certain
	Significant reduction of uncertainty will require a decade or more.	Virtually certain
	Full recovery will require many centuries.	Virtually certain
Project effects by mid-21st Century	Large stratospheric cooling	Virtually certain
	Global-mean surface precipitation increase	Very probable
	Reduction of sea ice	Very probable
	Arctic winter surface warming	Very probable
	Rise in global sea level	Very probable
	Local details of climate change	Uncertain
	Tropical storm increases.	Uncertain
	Details of next 25 years.	Uncertain

Source: World Resources Institute, 1994. *World Resources 1994-95*.

Scientific Consensus on Global Climate Change

The following scientific consensus on global climate change was based on the Intergovernmental Panel on Climate Change findings in which several hundreds of the world's leading atmospheric scientists participated under the auspices of the World Meteorological Organization and the United Nations Environment Programme: **virtually certain**

- nearly unanimous agreement among scientists and no credible alternative view; **very probable** - roughly 9 out of 10 chances of occurring; **probable** - roughly 2 out of 3 chances occurring; and **uncertain** - hypothesized effect for which evidence is lacking.

KIBARANI WASTE DUMP. The mangroves have died due to an oil spill in Mombasa harbor, Kenya (an oil storage tank burst) in 1988 and have not yet grown back.



Photo by B. Hachmoller

Tropical Coasts is being published to stimulate exchange of information and sharing of experiences and ideas with respect to environmental protection and the management of coastal and marine areas.

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