

**CARIBBEAN ACTION PLAN**

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**UNITED NATIONS ENVIRONMENT PROGRAMME**

**GUIDELINES  
FOR INTEGRATED PLANNING AND MANAGEMENT  
OF COASTAL AND MARINE AREAS  
IN THE WIDER CARIBBEAN REGION**

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United Nations Environment Programme  
Caribbean Environment Programme  
Regional Co-ordinating Unit  
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## CHAPTER 1. INTRODUCTION

### 1.1 Overview

The Regional Co-ordinating Unit (RCU) of UNEP's Caribbean Environment Programme (CEP) has undertaken the development of a regional framework for integrated coastal planning and management in the Wider Caribbean Region. The purpose of the framework is to support and strengthen institutional competence and facilitate preparation and implementation of integrated coastal planning and management activities in the region. The framework is intended to help organize *integrated coastal area management (ICAM)* at the national level, and to identify the need for selected regional approaches.

### 1.2 Background

Coastal areas throughout the developing world are among the most heavily exploited because of their numerous attractions and rich resources. The coastal and insular countries of the Caribbean are no exception to this condition.

The nations and territories of the Caribbean all share a common resource -- their regional seas (the Gulf of Mexico and the Caribbean Sea) -- which, together with the adjacent land areas, constitute the Wider Caribbean Region (Figure 1). On the region's eastern perimeter is the insular Caribbean -- the islands of the Greater and Lesser Antilles and those of the Bahamian chain to the north. The Gulf Coast states of the United States, coastal Mexico, Central America and the northern tier states of South America complete the terrestrial perimeter which encloses the region's two major basins -- the Gulf of Mexico and the Caribbean Sea.

The number of people in the region living near the sea is rising, along with the size and densities of coastal cities. All the capital cities of the insular Caribbean are situated on the coast, and throughout the entire region coastal areas are identified with principal industrial complexes, trade centers and resort tourism enclaves.

Coastlines, however, are not uniformly structured, accessible or suitable for human use or enjoyment -- a factor which results in further concentration. For example, in Trinidad's case, ninety percent of its people live along the leeward coastline of the Gulf of Paria, which represents only a third of Trinidad's total shoreline length. Why? Because the more exposed and isolated windward coasts on the north and east shores of Trinidad are far less hospitable and less desirable.

Competition for space along continental shorelines in the western and more southerly reaches of the region -- from the Gulf of Mexico and the Caribbean Sea to Suriname southeast of Trinidad -- is almost as severe. As a consequence, pollution along the more densely settled and heavily used segments of these coastlines

## ***Integrated Coastal Area Management***



Figure 1. Map of the Wider Caribbean Region.

has become pervasive as discharges have risen from both terrestrial and marine sources, including cruise ships and the oil industry. Management control strategies have so far proven insufficient, and these continuing impacts have devastated whole stretches of shoreline, marginalizing them for human enjoyment and for productive enterprises and employment.

The countries of the Wider Caribbean Region have moved with a limited sense of urgency to address this degradation. It is a cluster of problems and issues arising not just from pollution but from failed coastal area land use planning and development control procedures, excessive or injurious marine resource uses, carrying capacity overload, and deficient public sector management, monitoring and oversight.

In response to growing regional concerns, and at the request of the region's Governments, the Caribbean Environment Programme was initiated in 1976 by the

United Nations Environment Programme, with assistance from the Economic Commission for Latin America and the Caribbean (ECLAC). A framework for regional projects and activities was first formulated in Montego Bay in 1981, when an Action Plan for the CEP was adopted by the First Intergovernmental Meeting. The Action Plan serves as an instrumentality for bringing together regional Governments in the pursuit of common objectives that protect and develop the region's marine and coastal resources.

As part of the 1990-91 CEP workplan, a regional programme on Integrated Planning and Institutional Development for the Management of Marine and Coastal Resources (IPID) was identified and initiated. The long-term objective of this activity is to strengthen the capacity and competence of relevant institutions in the region with regard to the preparation and implementation of integrated management plans for small islands and coastal areas. The IPID programme considers amongst other issues:

- (1) the development of pilot projects on integrated coastal planning and
- (2) preparation of a *regional methodological framework document* to facilitate further integrated coastal planning activity in the region.

The current report is that framework document. It is designed to address the following issues;

- o appropriate institutional and legal arrangements for the preparation and implementation of integrated coastal and marine resource management plans;
- o organization and implementation of an integrated coastal planning process at the national level;
- o the major components of the plan preparation, implementation, and management process; and
- o new approaches to integrated coastal area management planning, implementation, and management.

### **1.3 Scope of the Framework Document**

The present document is primarily an adaptation of outside principles and experiences modeled to the needs, resources, and opportunities of countries in the Wider Caribbean Region. The material is not presented as a rigid set of prescribed steps and procedures. Rather, it represents a flexible approach consisting of management alternatives serving the same goal. The choice of the most suitable op-

tion in a given situation will depend on the actual circumstances of the area to be covered by an ICAM programme.

CHAPTER 2 of the framework document focuses on background information for ICAM. CHAPTER 3 introduces the reader to the subject of integrated coastal management planning and links it with other planning efforts. CHAPTER 4 moves to a four-phase discussion on developing and implementing ICAM programmes. CHAPTER 5 provides more information on specific tools and techniques to enhance ICAM programmes, and CHAPTER 6 briefly reviews several new concepts and approaches related to ICAM planning and implementation.

For those planners and managers who see the need for fuller guidelines to integrate programme design and implementation, the World Bank, in conjunction with UNEP and FAO, has prepared a set of guidelines on "Integrated Coastal Zone Management" in response to Agenda 21 as developed at the United Nations Conference on Environment and Development (UNCED) in 1992. These were distributed as a programme document at the October 1993 World Coasts Conference held in Noordwijk, Netherlands (World Bank, 1993). The guidelines aimed at developing a common understanding of the need, scope and general approach to *integrated coastal zone management* (ICZM\*) as a planning and management framework within the context of sustainable development. As such, the guidelines contain a general description of the complete range of elements to be considered within an integrated approach.

The World Bank "guidelines" document nevertheless provides an excellent umbrella for ICAM programme development. It presents the potentially arduous task as a manageable, continuous planning process involving numerous, diverse participants within complex institutional settings. The document is short, tightly written and is the best distillation of antecedent literature on the subject. It was designed for would-be coastal managers more as a conceptual representation of how the task of ICAM can be approached rather than as a set of prescriptive directions for exactly how each step should be done.

The recent publication from IUCN (Pernetta and Elder, 1993) provides guidelines and principles for coastal area development. The FAO document (J. Clark, 1992) is especially helpful and is quite generous with checklists and reminders. The

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\* Before 1985, CZM (coastal zone management) was a common acronym. Currently, ICZM (integrated coastal zone management) and ICAM (integrated coastal area management) are more common and virtually interchangeable. There are some who argue that two key words -- *planning* and *marine* -- should not be left out, that it should be "*integrated coastal and marine planning and management*" (ICMPM). However, this is cumbersome, produces an unpronounceable acronym and is quite unnecessary. "Coastal", as defined within the CZM construct, includes (or can include) land zones like estuaries and even watersheds, and *also* includes (or can include) marine zones or areas like the territorial sea or even the EEZ (Exclusive Economic Zone) out to 200 miles from the shoreline.

coastal zone management experience, especially at the state and "territorial" papers by Vallejo, Cicin-Sain, Nurse, McElroy, Lewsey and Atherley, *et al.* are noteworthy and pertinent to the region. The various review papers on the U.S. (Virgin Islands) level, are increasingly integrated and relevant to the challenges facing Caribbean countries, both continental and insular.

For a more extensive treatment, there are a half-dozen handbooks or guidelines available, complete with long sequential checklists of things to do and things to watch out for. These and a modest sampling of other manuals and journal articles on marine and coastal resources, planning, and ICAM are included in the References.

For government officials and community leaders confronting the task of developing a new national initiative, these guidelines present a broad spectrum of examples to draw from and an excellent support base of narrative, analytical, instructional, and technical documentation. These, in turn, reflect the experience of both developed and developing states, insular and continental, temperate and tropical areas, each with a different set of coastal problems, each at a different starting point or at a different stage in adjusting existing planning and management mechanisms to optimize coastal resource development by employing more integrated, more methodical and more sustainable procedures.

Finally, a brief introductory word about the concept of *integration* and *integrated coastal area* planning and management. (See also Sections 3.2 and 3.3 for a more detailed articulation of this widely used but seldom defined nomenclature.)

Integration, as a planning term, describes a broad process designed to compensate for system complexity and compartmentalization. It is a mechanism for better understanding linkages, including causal, systemic, spatial and temporal interrelationships. As a process, it is more dynamic than static, more open than closed, more holistic than sectorial. It focuses on an interdisciplinary search for workable solutions to resource management issues, including policy definition, resource allocation, ecosystem health, conservation and sustainability. Integration encourages an expanding, interactive, vertical dialogue among governmental and private sector administrative hierarchies. It also encourages a horizontal dialogue among governmental units, stakeholder groups, and relevant institutions at various levels.

In these guidelines, the specific focus is on understanding coastal areas and coastal issues, and the interactive resource elements, sufficient unto the task of defining more sustainable public policies, programmes, and strategies at all levels and among all interested parties, simultaneously. This required focus is largely unachievable without an integrated approach to the task.

At its best, integrated coastal area resource planning and management interweaves economic, social, physical and environmental considerations equally into a mainstream strategy at every stage (and level) of policy design, policy

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implementation, and policy review. It requires long-standing institutional support and intellectual discipline if it is to serve the state well. Its genius is in its openness, its flexibility, and its responsiveness to the needs of people.

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## CHAPTER 2. THE NEED FOR AND THE CONCEPT OF ICAM

### 2.1 Common Problems in Coastal Areas of the Wider Caribbean

The Wider Caribbean Region encompasses an area of 33 States and Territories encircling the two connected basins, the Gulf of Mexico and the Caribbean Sea. It includes continental countries, island nations and dependent territories, as well as a great variety of political, economic, social and natural resource systems. Culturally, the region is abundantly endowed. Its people spring from five continents, contributing to a vibrant collage of races, religions, customs and ethnic groups. On the one hand, the Wider Caribbean is a region of limited resources and great economic disparities; on the other, it is an area with great energy and a richness of cultural diversity.

The 80 million inhabitants who live in the islands and coastal areas of the region's continental countries, and the approximately 20 million tourists who visit each year, are dependent on a healthy marine environment. Major marine-based industries (Table 1) -- such as fisheries, sea transportation (upon which agriculture is dependent), oil and gas extraction, and, more recently, tourism -- have all played an important role in the development of the Wider Caribbean Region.

The Wider Caribbean, as a large ecosystem, is under serious threat. Its coastal marine subsystems -- such as coral reefs, seagrass beds, estuaries and mangrove communities -- are now threatened by growing populations, unsustainable development practices, insufficient management attention, and limited public understanding and appreciation of their important role. Yet, it is these same ecosystems that are the basis of the region's productivity, high biodiversity, and much of its food supply. They are also a bulwark against natural disasters like hurricanes, provide for coastal stabilization, and are essential to key economic sectors such as tourism.

For the insular Caribbean, productivity is largely dependent on its vulnerable coastal marine habitats. Most of the commercially harvested species of fish and shellfish depend on mangroves, seagrasses and coral reefs at important stages in their life cycles. Moreover, due to circulation patterns in this semi-enclosed sea, most fishery populations appear linked at a Caribbean-wide level.

There is, of course, greater productivity off the northern coast of South America due to higher nutrient levels from rivers, estuaries and upwelling. However, the high productivity of these coastal marine ecosystems is also threatened by lack of an adequate policy management and enforcement framework in which to manage resources for ecologically sustainable development. Habitat loss and environmental degradation is the primary threat to the region's marine productivity.

**Table 1. Wider Caribbean COASTLINE ACTIVITY  
(selected states)**

	Length of Marine Coast (km)	Maritime Area (000 sq km)		Urban Population in Large Coastal Cities (in 1,000s)		Average Annual Volume of Goods Loaded and Unloaded 1988-90 (000 metric tons)			Annual Petroleum Production		Proven Oil and Gas Reserves	
		Shelf to 200m depth	Exclusive Economic Zone			Crude	Products	Dry Cargo	Oil (1,000 metric tons) 1992	Gas (million cubic meters) 1992	Oil (Million metric tons) 1992	Gas (billion cubic meters) 1992
				1980	2000							
<b>Caribbean</b>												
Antigua/ Barbuda	153	x	x	x	x	0	61b	83	0	0	0	0
Bahamas	3542	85.7	759.2	x	x	10524	3702	3222	0	0	0	0
Barbados	97	0.3	167.3	100	146	107b	51b	573	0	0	0	0
Cayman Islands	160	x	x	x	x	1357	36b	117				
Cuba	3735	x	362.8	6628	8942	5850b	3821	14244	0	0	0	0
Dominica	148	x	20.0	x	x	x	5b	93	0	0	0	0
Dominican Republic	1288	18.2	268.8	2787	5797	1630b	785b	4358	0	0	0	0
Grenada	121	x	27.0	x	x	x	22b	71	0	0	0	0
Guadeloupe	306	x	x	142	196	x	370b	1221				
Haiti	1771	10.6	160.5	1216	2845	x	11b	838	0	0	0	0
Jamaica	1022	40.1	297.6	1016	1689	1210b	1203	10122	0	0	0	0
Martinique	290	2.4	x	217	279	231b	282	876				
Trinidad & Tobago	362	29.2	76.8	623	1110	6518	2670	5638	6922	5799	78	261
<b>Central America</b>												
Belize	386	x	x	x	x	0	106b	306	0	0	0	0
Costa Rica	1290	15.8	258.9	1050	2258	464b	336b	2662	0	0	0	0
Guatemala	400	12.3	99.1	780	932	683	204	4232	0	0	0	0
Honduras	820	53.5	200.9	583	1923	397b	204	1849	0	0	0	0
Mexico	9330	442.1	2851.2	6529	9501	71817a	7377	19833	85656	11370	5712	1926
Nicaragua	910	72.7	159.8	1166	2837	495b	183b	1280	0	0	0	0
Panama	2490	57.3	306.5	989	1749	1192b	441	1939	0	0	192.7	7
<b>South America</b>												
Colombia	2414	67.9	603.2	2926	3926	9442	6901	15231	0	0	10	40
French Guiana	378	x	x	x			137b	273	0	0	0	0
Guyana	459	50.1	130.3	213	425	x	474b	1919	0	0	0	0
Suriname	386	x	101.2	140	216	x	615b	6185	0	0	0	0
Venezuela	2800	88.1	363.8	5158	9324	58367a	23564	26768	42728	5375	966	765

Source: World Resources Institute, *World Resources Report 1994-95*, Table 22.6 .

Notes:  
 X - not available.  
 a - Goods loaded  
 b - Goods unloaded

The real challenge lies in the improvement of coordinated support to plan, monitor, manage and restore coastal marine ecosystems in the Wider Caribbean Region. Coordinated regional management is essential as the efforts of individual countries to improve environmental conditions cannot succeed if other nations continue to overexploit and pollute the shared ecosystems. In this context, the Caribbean Environment Programme provides an excellent framework for comprehensive, integrated, and coordinated efforts for the planning, management and development of marine and coastal natural resources.

## 2.2 Regional and Global Legal Instruments

As the increasing pollution of coastal and marine areas in the Wider Caribbean Region has become more apparent, legal instruments focusing on the reduction, abatement and control of coastal marine degradation in the region have been put in place.

The primary legal instrument of the Caribbean Environment Programme is the ***Cartagena Convention*** (Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region), which was adopted in 1983 and came into force in 1986. Under the Convention, the contracting parties agreed to prevent, reduce, and control pollution from ships, land-based sources, air-borne sources, and sea-bed activities. The Convention also commits the parties to the preservation of unique and fragile ecosystems and habitats of endangered species. The Cartagena Convention provides a framework for the development of a number of specific protocols.

The ***Protocol (to the Cartagena Convention) Concerning Cooperation in Combating Oil Spills*** was also adopted in 1983 and came into force in 1986. Pursuant to this Protocol, the countries of the Eastern Caribbean have collaborated, with assistance from the International Maritime Organization (IMO), in preparing an oil spill contingency plan for cooperating in the event of a major oil spill. The plan establishes policy and addresses the responsibility of participating states in response operations, requests for assistance, mutual cooperation, and the use of dispersants.

The framework for coordinated regional action on protected areas and biodiversity is provided by the ***Protocol Concerning Specially Protected Areas and Wildlife (SPAW) to the Cartagena Convention***, which was signed in 1990 (see also Section 4.2.3). The Protocol has not yet entered into force. It is designed to create a network of national parks and protected areas (including coastal and marine parks and protected areas) in the Wider Caribbean Region and to provide mechanisms to encourage and support their establishment and management. The SPAW Protocol includes the requirement that common guidelines and criteria be established for:

- (i) the identification, selection and management of protected areas and species;
- (ii) the establishment of protected areas, including parks, reserves, and sanctuaries; and
- (iii) the evaluation of projects that could potentially have an impact on listed areas or species.

The Cartagena Convention also provides for the development of a third protocol on land-based sources of marine pollution for the Wider Caribbean Region. Within the framework of the CEP's Action Plan, such a protocol (***Protocol Concerning Land-based Sources of Marine Pollution***) is presently under preparation.

On the global level, there are various conventions and treaties which encompass the Wider Caribbean Region.

The ***United Nations Convention on the Law of the Sea*** was prepared by the international community over a period of 13 years in what was the largest, longest and most complex international conference in history. UNCLOS III culminated in the adoption of the Convention (Montego Bay, 1982). This Convention contains nine technical Annexes covering all matters related to sea management and preservation. As such, it is complemented by a number of international agreements. On the 16th of November 1994, the Convention of the Law of the Sea became in force.

The ***International Convention for Prevention of Pollution from Ships (MARPOL 73/78)***, and its five annexes covering the various sources of ship-generated pollution, are designed to preserve the marine environment worldwide by preventing and reducing pollution from ships. This international convention was originally adopted by the International Conference on Marine Pollution in 1973 and subsequently modified by Protocol in 1978. Regulations addressing the various types of ship-generated pollution are contained in the five annexes of the Convention.

In 1993, the Wider Caribbean Region was designated a "special area" under MARPOL Annex V. With this designation, strict regulations controlling the discharge of garbage from ships will become applicable in the Wider Caribbean Region.

The ***United Nations Conference on Environment and Development (UNCED)*** (Rio de Janeiro, 1992) provides an international framework for the analysis of the critical social, economic and environmental challenges inherent in the search for sustainable development. Agenda 21 of the "Earth Summit", as the Conference is also known, considered the conservation and management of resources and, in particular, Chapter 17 considers the Protection of the Oceans, Seas and Coastal Areas, including their living resources. As a result of the UNCED Conference, Global

Conventions on Climate Change, the Ozone Layer, and Biodiversity were signed by many countries in the Wider Caribbean Region.

## 2.3 The Coastal System

The coastal "zone", where the land meets the sea, comprises several types of systems, including socio-economic systems and natural systems (such as estuaries, watersheds, coastal lagoons, coral reefs and ocean areas out to 200 nautical miles). Each of these systems has distinctive properties; in the aggregate, they provide the typical characteristics of the coastal area, which is the subject of management.

Integrated Coastal Zone Management (ICZM) involves the continuous planning and management of the use of coastal lands and waters and their resources *within some designated area*, the boundaries of which are usually politically determined by legislation or by executive order. On land, the area included within the management unit may comprise the shore and extend landward to some designated limit, such as the boundary of governmental jurisdiction (e.g., a state or parish or an entire watershed). Seaward, the designated area may extend from the low tide shoreline to either the edge of the continental shelf or for 200 nautical miles, to the boundary of the Exclusive Economic Zone (EEZ). Consequently, a coastal zone -- the integrated management area -- is "... the band of dry land and adjacent ocean space (water and submerged land) in which terrestrial processes and land uses directly affect oceanic processes and uses, and vice versa" (Ketchum, 1972). Figure 2 shows a cross section of a coastal zone, with options for seaward and landward boundaries.

### 2.3.1 Coastal Resources

Coastal resources can be regarded as commodities in the production of the goods and services which make the coastline a popular and busy place. They include natural, human and man-made components:

- o *Physical/geomorphic elements.* Comprised principally of fastland, beaches, headlands, coastal islands, peninsulas, tombolas, barrier reefs.
- o *Natural systems.* A coastal zone contains a number of physiographic units or ecosystems with particular biophysical properties and processes, including flora and fauna and non-renewable resources. These units can be classified in various ways, but the designation of a coastal area for management was and still is largely politically determined, e.g., administrative boundaries. Ecosystem boundaries are now being reevaluated, however, as essential to management for sustainability.

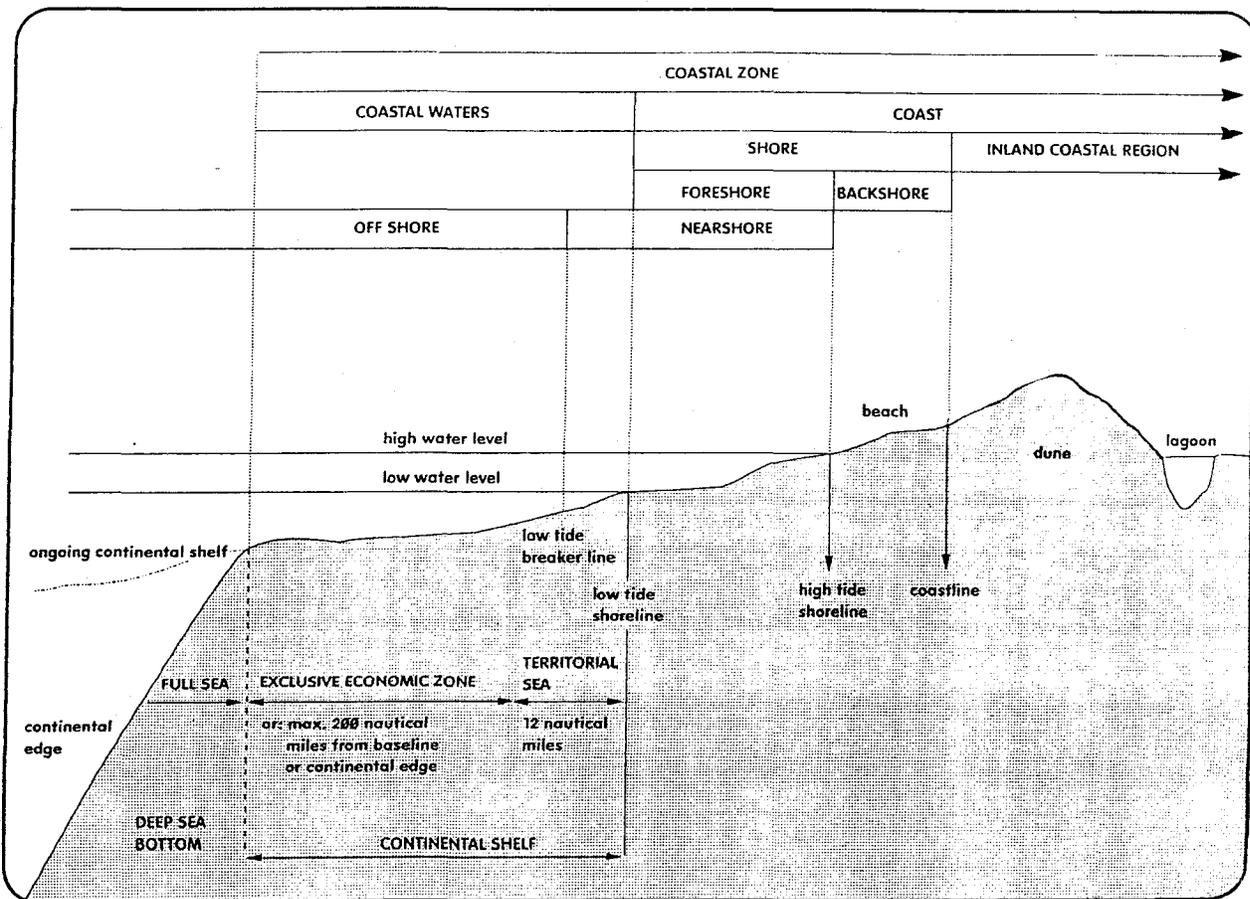


Figure 2. Potential Boundaries of A Coastal Management Area (adapted from Awosika, *et al.*, 1993).  
 NB. The landward boundary of the "coastal zone" is customarily established inland of the point shown in order to incorporate some portion or all of the watershed area affecting the coastal area, or at some convenient administrative or geographical boundary. For small island states in the insular Caribbean, the entire island may be considered a coastal area. The reader's attention is also directed to the related issues of scale (Section 5.1.1) and boundaries discussed in more detail in Sections 4.1.6 and 4.3.8.

- o **Human resources.** People living and/or working in coastal areas may be involved in the production of goods and services from that specific area (such as the exploitation of oil and gas, fishing, agriculture), the creation of tourism and recreational facilities, the protection of areas below sea level, or the conservation of scenic locations. Human technical skills, cultural backgrounds, level of organization, etc. are important components in the way natural resources are made accessible and used in the production of goods and services.

- o *Constructed resources.* Man-made structures change the accessibility of resources, the spatial and time distribution, and the quality of available natural resources. For example, roads increase accessibility; treatment plants improve the quality of available water; dams in a river alter the distribution of water flows over time; sea defenses create and protect areas for urbanization; and beach nourishment creates recreation and tourism facilities. Man-made structures also include urbanized areas with structures for housing and economic activities, as well as social/commercial infrastructure. Many of these structures often limit the access to the coastal resources or represent a threat to these resources.
- o *Cultural/heritage/archaeological resources.* Sites and landmarks with particular cultural, historic or aesthetic qualities give a special character to a coastal zone, and determine whether it is attractive for tourism and recreation or for urban development. Submerged archaeological sites have resource value from both a cultural and touristic perspective.
- o *Oceanic basin system.* Includes currents, waves, fisheries, tsunamis, and tides, among other things.
- o *Atmospheric system.* Includes hurricanes and other seasonal storms, weather and clean air.
- o *Viewshed systems.* Scenic coastal assemblages of elements of all of the above.
- o *Recreational systems.* Assemblages of the systems above that contributed to the mental and physical well-being of residents and visitors alike.

Coastal resources are often common property resources with open (free) access to all users. Free access often leads to excessive use, and to the degradation or exhaustion of resources; this is the "tragedy of the commons". For example, the use of coastal areas for the disposal of the "leftovers" from society's activities may exceed the assimilative capacity of the coastal environment, leading to degraded water quality and/or habitats. Management intervention is generally necessary to achieve desired levels of maximum sustained yield, as well as desired levels of quality of coastal resources. There is a trend presently in many countries to allow for privatization of these former common areas which leads to limitations on free access, with frequent unanticipated environmental costs.

Coastal resource systems are valuable natural endowments that need to be managed for present and future generations. Coastal zones offer physical and biological opportunities for human use, and managers try to find the optimum balance between these uses based on a given set of objectives. Concern is growing in particular about the destruction of natural coastal ecosystems by the demands placed upon them by population and economic growth. These natural ecosystems have

considerable value for sustainable extractive and non-extractive use which is often undervalued in comparison with other often non-sustainable uses.

In nature, the coastal system maintains an ecological balance that accounts for shoreline stability, beach replenishment, and nutrient generation and recycling, all of which are of great ecological and socio-economic importance. These natural systems are under increasing threat from unmanaged human activities such as pollution, habitat destruction and overexploitation of resources.

In coastal rural areas, fishing of nearshore waters and farming of coastal lowlands are the major economic activities supplying fish and agricultural products for subsistence of the inhabitants and urban centers. Activities that add further value to coastal resources include recreation and tourism, which have become major sources of domestic and foreign exchange earnings in many coastal nations.

The intrinsic economic value of coastal resources represents a "capital" investment for humankind by nature. The goods and services derived from them are the return on the investment. The principles of good husbandry are not restricted to the agricultural sector alone, but can be applied to coastal resources with customized technologies.

Traditionally, the management of coastal resources involves the resolution of both long- and short-range problems. Long-range problems include: beach and shoreline erosion, possible climate change causing sea level rise and changing hydrological patterns; the accumulation of pollutants and their effects on species; and increasing development of coastal and inland areas with resulting modification of the quantity, quality, and time patterns of inputs to coastal waters. Short-range problems include: storm damage; dredging impacts; and over-harvesting of fish, sand, corals, and mangroves. Management is essential to prevent, or at least to mitigate, the adverse effects of these pressures.

Coastal areas are rich in natural resources, which are often lost through counter-productive efforts to protect development in hazard areas from coastal storms. Beaches, dunes, and wetlands are destroyed both by construction of poorly planned and located public and private projects and by subsequent construction of protective works such as seawalls to armor these projects from coastal erosion and storm surges. Construction in these higher-risk areas interferes with the geological and ecological processes that maintain the natural protective and productive coastal systems. Estuarine wetlands are often damaged by dredge-and-fill activities. Seawalls and groins may provide localized storm protection but also cause loss of beaches and dunes due to increased erosion from wave action and interference with normal patterns of sand transportation by ocean currents.

Coastal area management programmes can prevent the loss of natural resources through development regulations, proper monitoring and enforcement. By combining preventive measures such as shorefront building setbacks with restrictions

**Box 1. COASTAL CRISES**

***Common Problems and Solutions***

**ISSUES AND PROBLEMS**

- Depletion of inshore commercial and recreational fisheries from overfishing
- Degradation of coastal habitats
- Damage of coastal areas from uncontrolled development
- Beach damage from sand mining and vegetation removal for resort development
- Water pollution from oil, sewage, urban runoff and sediments
- Harbor and estuarine pollution, congestion, and siltation
- Nutrient pollution of coastal waters from agricultural fertilizers and pesticides
- Loss of coastal wetlands and estuarine habitats
- Loss of scenic landscapes and seascapes, and historic areas

**EFFECTIVE ACTIONS**

- Sustainable fisheries management for long-term productivity; possible limited entry
- Improved management of biodiversity
- Control of coastal development through planning, zoning and permitting procedures
- Management of tourism for minimal erosion and reduced environmental impact
- Improved control of watershed effluents and urban waste disposal practices
- "Special Area" management planning, including use of EIA process, for harbors, wetlands, estuaries, industrial sites, and urban areas
- Development of non-point source pollution control programme
- Establishment of no net loss policy for wetlands
- Landscape management and easement strategies to protect scenic coastlines and historic sites

on coastal armoring, governments can protect the natural resource systems necessary to maintain the beaches, as well as to safeguard future coastal development and infrastructure (see Box 1).

***2.3.2 Coastal Ecosystem Management Issues***

**(1) Key Ecological Processes**

Any coastal ecosystem management programme must look to, and protect, important ecological processes, i.e., the underlying factors which explain the high production levels of coastal seas such as:

- a) the key role of fresh and marine waters in providing and renewing nutrients, organic material, and oxygen;
- b) solar radiation which is maximized as an energy source because of the characteristic shallow depths of these areas; and
- c) the high mixing rates which assist gas exchange, nutrient circulation and waste removal.

**(2) Ecosystem Planning Boundaries**

The complexity of biotic systems and the interrelatedness of their components require that each coastal ecosystem be managed as a whole system. Neither piecemeal management nor treatment of single components or single species will fully succeed. Furthermore, the major external sources of influence on coastal systems must be considered -- shoreland watersheds, shoreline areas, and off-shore waters are all linked to the coastal system. Therefore, the ecosystem defined must embrace a complete and integral unit, one that includes a coastal water basin or basins and the adjacent shorelands to the extent that they have significant influence on coastal waters.

**(3) Land-Sea Interactions**

*A major value of integrated coastal zone management is that it addresses the land and the sea simultaneously.* Linkages between the land and the sea preclude sustainable development of coastal/marine resources without coordinated management.

*It is basic to coastal management to recognize how strongly activities on land affect the condition of the sea.* The sea is impacted by distant events that occur far inland -- river discharges, deforestation, land cultivation, urban and industrial activities -- all may affect coastal ecosystems.

Conversely, the sea strongly affects the land and intertidal areas, for example, pollution from tanker bilge washings or property destruction from hurricane storm flooding and wave action. The countering "natural defenses" of the coastline -- beaches, mangroves and coral reefs -- can be extremely important for protecting shorelines and coastal villages against storm waves and shore erosion.

***2.3.3 What Does Coastal Zone Management Do?***

Coastal zone management is a special planning process with a complex and dynamic target area focused on the interface of land and sea, and embracing:

- o some fixed, some flexible boundary concepts,
- o an ecosystem conservation ethic,
- o socio-economic goals,
- o an active, problem-solving, participatory management style, and
- o a strong scientific base.

As such, coastal zone management represents many different things to different people. To the conservation minded, the concept represents either a panacea for every excess of the private sector or governmental agencies, or the solution to every unsolved coastal-related problem. Others fear "management" as yet another intrusion by the government into the "rights of the individual", or the imposition of additional "red tape" and bureaucratic delay. It is often interpreted as "environmental determinism", the imposition of natural environmental values over all others.

Most early coastal programmes reflected an antecedent failure of the existing system of national and/or local development planning to respond to the visibly adverse effects of crowding, technology advancement, urban growth, privatization, and waste disposal practices that were changing coastal areas. In the public's mind, there was a need to answer the public policy question, "Who's minding the shore?" The answers were not encouraging and usually led to development of modest, narrow purpose, first-stage programmes with a limited agenda.

In a subsequent phase, community concerns influenced the coastal management process to expand its purview to include:

- o **special area planning** (e.g., problem solving for ports, industrial areas, ocean outfalls, energy siting, tourism enclaves);
- o **systems planning** (e.g., estuaries, coral reefs); and
- o **marine areas planning** (e.g., fisheries reserves, marine parks, EEZ surveys).

Typically, particular government ministries, departments and/or agencies are responsible for particular resources or uses. However, in some countries much of the coastal zone is privately owned, and attempts by the government to guide the management of private lands can be a source of conflict. Under these conditions, coastal area planning has been severely tested and, in some situations, has had to confront the loss of public support.

In reality, sound coastal zone management is none of these extremes. A successful programme is based on a *comprehensive and integrated planning process* which aims at harmonizing cultural, economic, and environmental values and balancing environmental protection and economic development with a minimum of regulation. Management *without* an appropriate planning process tends to be neither integrated nor comprehensive, but rather a sectorial (and often *ad hoc*) activity. Any coastal initiative must be linked to all phases of the planning process and pay particularly careful attention to differences in scale for both planning and management.

Sound coastal zone management builds a dialogue which pools the knowledge of both experts and the public to produce a technically sound and clearly stated management programme that has the widespread support necessary for

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programme approval and effective implementation. The following standard goals and objectives help illustrate what coastal zone management means.

(1) It accommodates growth and facilitates economic gains and at the same time protects valuable and irreplaceable natural resources by:

- managing the impact of human activity so as to maintain and, where possible, enhance the coastal environment;
- managing the exploitation of renewable resources to achieve optimum sustainable yield; and
- managing non-renewable resources in light of long-term needs and interests.

(2) It promotes public use and enjoyment of the shoreline as well as uses of submerged lands which are in keeping with the doctrine of public trust by:

- insuring that traditional uses are protected;
- insuring that diverse recreational opportunities are public, available, affordable and reasonably convenient; and
- protecting and enhancing scenic quality for the benefit of residents and tourists alike.

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## CHAPTER 3. INTEGRATED COASTAL MANAGEMENT PLANNING

### 3.1 From ICZM To Integrated Coastal Area Management (ICAM)

There is an emerging consensus -- one analyst (Cincin-Sain, 1993) calls it the new synthesis -- which, since UNCED in 1992, has acquired the popular label "*integrated coastal area management*", or ICAM.

What was for over two decades coastal zone or coastal area management has recently come to be referred to as integrated coastal area management. The new acronym ICAM and the old CZM or ICZM are used interchangeably. There is no consensus about the utility of adding the word "marine" to pair off with "coastal" and the word "planning" to pair off with "management". This document assumes the marine area is subsumed within the term coastal (which includes land and sea areas) and further assumes planning as a function is a given and ongoing prerequisite component to the management process.

This sub-section is about the characterization of ICAM and its "planning" tasks. It is also about linkages with other national and local area planning activities -- hence the slight variation in wording in the heading.

The transition from the 1970's prototype, single-sector coastal management initiatives into the more comprehensive, internationally accepted and more integrated programmes of today was based on a steady sequence of challenges and successes. Progress has been extraordinary. In just over two decades, an innovative planning management concept for dealing with a very complex piece of global geography -- the coastal zone -- has gone from theory to practice.

This reflects a wide international response to the following:

- (1) The challenges posed by national socio-economic needs *via a vis* the coastal zone, i.e., changing user patterns of exploitation and expanding coastal, water-dependent demands (tourism and mariculture, for example).
- (2) An emerging awareness of the value and importance of coastal areas to national economic growth and well being, in company with a growing awareness of the short and longer term costs of environmental degradation and resource mismanagement as a constraint on development.
- (3) A growing recognition that standard sectorial planning *and* its management counterpart have failed to deal effectively with coastal and nearshore issues, mostly by failing to address ecosystem needs and the husbandry of ecological services.

- (4) The international acceptance of the idea of cross-sectorial, interdisciplinary planning and comprehensive, if not fully integrated, management practices and principles in pursuit of more sustainable development (donor institutions worldwide have generally been supportive of the principle and the practice, including planning for coastal area management and its more integrated, recent iterations).
- (5) That integrated coastal management planning must be recognized as an extended and integral part of traditional physical planning. The opposite approach -- two separate and parallel activities -- will only lead to competition for human and financial resources and will create a misunderstanding among policy and decision makers, planners, scientists and the public about what ICAM stands for -- namely, to widen the geographic scope of the planning concept to include marine areas and land-sea interactions.

Testimony on the vitality and maturity of *integrated* coastal area management as an approved and preferred governmental programme option is best found in the prominent visibility given ICAM on the agenda of the United Nations Conference on Environment and Development (UNCED) in 1992. The emphasis given the interplay of ICAM (or ICZM) in national development planning, especially in Chapter 17 of Agenda 21, confirms the universally held view that the coastal zone will play a leading role in implementing the sustainable development strategies so fervently desired by the international community (Vallejo, 1993).

### **3.2 The Concept of ICAM (or ICZM)**

There is no shortage of definitions of "integrated coastal area management" (ICAM). A few recent examples are provided.

*[ICAM is a] dynamic process in which a coordinated strategy is developed and implemented for the allocation of environmental, socio-cultural and institutional resources to achieve the conservation and sustainable multiple use of the coastal zone (Sorensen, 1993).*

*ICAM is an adaptive process of resource management for environmentally sustainable development in coastal areas. It is not a substitute for sectorial planning, but focuses on the linkages between sectorial activities to achieve more comprehensive goals (UNEP, 1993a).*

*Integrated Coastal Zone Management (ICZM) has been identified as the most appropriate process to address current and long term coastal management issues, including habitat loss, degradation of water quality,*

*changes in hydrological cycles, depletion of coastal resources and adaptation to sea level rise ....* (Awosika, et al., 1993).

Robert Knecht, a long-standing CZM professional and CZM programme director now turned scholar, emphasizes a slightly more activist, interventionist definition as follows:

*Integrated coastal management is a dynamic process by which decisions are taken for the use, development and protection of coastal areas and resources to achieve goals established in cooperation with user groups and national, regional and local authorities. Integrated coastal management recognizes the distinctive character of the coastal zone -- itself a valuable resource -- for current and future generations. Integrated coastal management is multiple purpose oriented, it analyzes implications of development, conflicting uses, and interrelationships between physical processes and human activities, and it promotes linkages and harmonization between sectoral coastal and ocean activities* (Knecht and Archer, 1993).

Jens Sorensen (1993), another long-standing scholar of coastal zone affairs, offers a more detailed explanation, ascribing five attributes of ICAM as:

1. A dynamic process that continues over time (implying change, revision, adaptation, even error).
2. Involving a governance arrangement to establish policies for making allocation decisions and the power to make such decisions.
3. A governance arrangement that uses one or more management strategies to rationalize and systematize resource allocation decisions (i.e., land use plans, impact assessments, regulations, permits, etc.).
4. Management strategies that rely on a systems approach, recognizing interconnections among coastal and marine systems and subsystems (these include coastal watersheds, estuary circulation systems, the longshore movement of sediments within littoral cells, populations of species that are harvested for their commercial or recreational value, and water supply, sewage treatment and highway systems).

5. Having a geographic boundary space extending from the ocean environment across the transition shoreline to some inner terrestrial limit (except on islands).

The developing literature on ICAM (or ICZM) worries excessively about what is and is not truly integrated and truly coastal. For example, how does one classify a marine park and protected areas planning effort on a coastline that uses integrated, interdisciplinary methodology? Should it be referred to as a legitimate ICAM effort, or is it an ordinary sectorial plan? Sorensen (1993) is correct when he says the essential ingredients are (1) a coastal systems perspective and (2) a multisectorial approach. (See also Box 2.)

### **3.3 Integrating Dimensions of ICAM**

The dimensional aspects of ICAM are a function of the kinds of integration required, which set the pattern of outreach, peripheral involvement, and the nature of partnership, participation and negotiation with other coastal resource users and institutions. There are at least seven different kinds of integration (each of which has its own dimensional limits (Knecht and Archer say there are only four, here presented first).

- (1) ***Intergovernmental.*** This dimension encompasses the necessary integration of various levels of government into coastal management, especially between the national level and regional/local levels. Determining the level and type of active involvement of various governmental units (including fragmented planning activities), and providing the choreography for their participation in the various geographic segments of the coastal zone (see Figure 2) is an integrative task, as it especially affects the enforcement side of landscape and seascape quality controls, licensing, leases, permits, and risk management.
- (2) ***Land-Water Interface.*** Clearly, integration across the land-water boundary is basic to the concept of coastal management. The coastal zone area to be managed is usually defined in terms of both a shoreland area (the uses of which affect the coastal waters) and a water area (the uses and disturbances of which affect the shoreland). Understanding the effects which traverse the land-water boundary (in both directions) is of fundamental importance.
- (3) ***Intersectorial.*** It has become increasingly clear that the rational management of coastal resources requires that all activities affecting such resources (or the coastal environment in which they reside) come within the "reach" of the management programme. For example, dredging to create a deeper harbor and/or safer navigation channels can potentially affect habitats that are of critical importance to coastal fisheries. Hence, such dredging must be within the policy and regulatory purview of the coastal management programme.

**Box 2. FAO ICAM PREMISES AND PRINCIPLES**

- Principle 1** The coastal area is a unique resource system which requires special management and planning approaches.
- Principle 2** Water is the major integrating force in coastal resource systems.
- Principle 3** It is essential that land and sea uses be planned and managed in combination.
- Principle 4** The edge of the sea is the focal point of coastal management programmes.
- Principle 5** Coastal management boundaries should be issue-based and adaptive.
- Principle 6** A major emphasis of coastal resources management is to conserve common property resources.
- Principle 7** Prevention of damage from natural hazards and conservation of natural resources should be combined in ICAM programmes.
- Principle 8** All levels of government within a country must be involved in coastal management and planning.
- Principle 9** The nature-synchronous approach to development is especially appropriate for the coast.
- Principle 10** Special forms of economic and social benefit evaluation and public participation are used in coastal management programmes.
- Principle 11** Conservation for sustainable use is a major goal of coastal resources management.
- Principle 12** Multiple-use management is appropriate for most coastal resource systems.
- Principle 13** Multiple-sector involvement is essential to sustainable use of coastal resources.
- Principle 14** Traditional resource management should be respected.
- Principle 15** The environmental impact assessment approach is essential to effective coastal management.

Source: Clark, J., 1992. *INTEGRATED MANAGEMENT OF COASTAL ZONES*. FAO Fisheries Technical Paper 327. Food and Agriculture Organization of the United Nations, Rome.

- (4) **Interdisciplinary.** This dimension pertains to the need for a holistic approach to ICAM. It reflects the realization that coastal zone issues not only involve the use and protection of natural resources and the coastal environment, but that significant economic and social issues almost always exist as well. Decisions to protect or develop a particular resource usually have significant economic implications. Major social and cultural issues can also be involved.

- (5) ***Institutional***. The institutional partners in any ICAM effort can vary qualitatively and quantitatively as to skill, competence, capacity, and commitment. Some may require direct technical support or even financial support to do what ICAM needs doing. Others may be in a position to make substantive, continuing contributions of time, effort and custodial responsiveness for a given task with which the ICAM needs assistance. The integration of these various kinds of institutions (governmental, non-governmental and private sector) into a collaborative programme is a management achievement.
- (6) ***Temporal***. ICAM's response for responsible and effective performance runs from a short 24-hour hurricane warning to a 200-year storm planning regime for wave run-up and inland flooding. Ecosystems, resort tourists, fishermen and politicians facing elections have different clocks ticking. ICAM has to blend or integrate these temporally different planning perspectives into a coherent investment strategy for coastal protection and development.
- (7) ***Managerial***. A basic element of an ICAM programme is the integrative arrangement of management responsibilities. Management arrangements comprise institutional arrangements and management instruments. Institutional arrangements provide an integrated framework within which the management tasks are carried out and the management instruments applied. This integrated framework needs to include:
- the structure of government and non-governmental organizations, including mechanisms for linking responsible agencies and organizations in different kinds of integrative relationships;
  - the set of laws, conventions, decrees and standards for environment quality;
  - the set of traditions and social norms such as customary laws; and
  - NGOs and service organizations.

It is noted that the inclusion of NGOs and the local public in *both* the planning *and* management process is of vital importance for a successful ICAM programme. Commitment by the public to fulfilling the goals of ICAM, created by its participation in the planning process, is of particular importance in situations where the legal and administrative framework to implement and monitor the ICAM programme is weak or nonexistent.

- (8) ***International***. External coastal boundaries are often shared with adjacent countries. On a regional scale, member states within a large marine ecosystem, like the Wider Caribbean, will of necessity find that the search for management strategies requires collaboration for effective ecosystem management, with international, bilateral, multilateral, and regionally focused NGO partners.

## 3.4 Organizational Aspects of ICAM

### 3.4.1 Management Boundaries

ICAM programmes inevitably involve the continuous management of use activities within some designated area, which are customarily set by legislative or executive order. On land, the area generally comprises the shore zone (e.g., beach, lagoon, wetlands dunes, cliffs, etc.) and extends inland some specified distance -- often to a convenient political administrative boundary but sometimes to the upper reaches of tidewater or the entire watershed. Seaward, the area may extend from the mean low water line to the outer limit of territorial waters or the continental shelf or the outer boundary of the EEZ. Tentative planning boundaries are a defensible expedient, knowing that they may be adjusted in light of experience.

Figure 2 (in Section 2.3) displays a cross section of a hypothetical coastal zone area, showing various boundary options. Vertical dimensions are required to indicate submerged features and atmospheric hydrospheric interactions.

### 3.4.2 Programme Boundaries

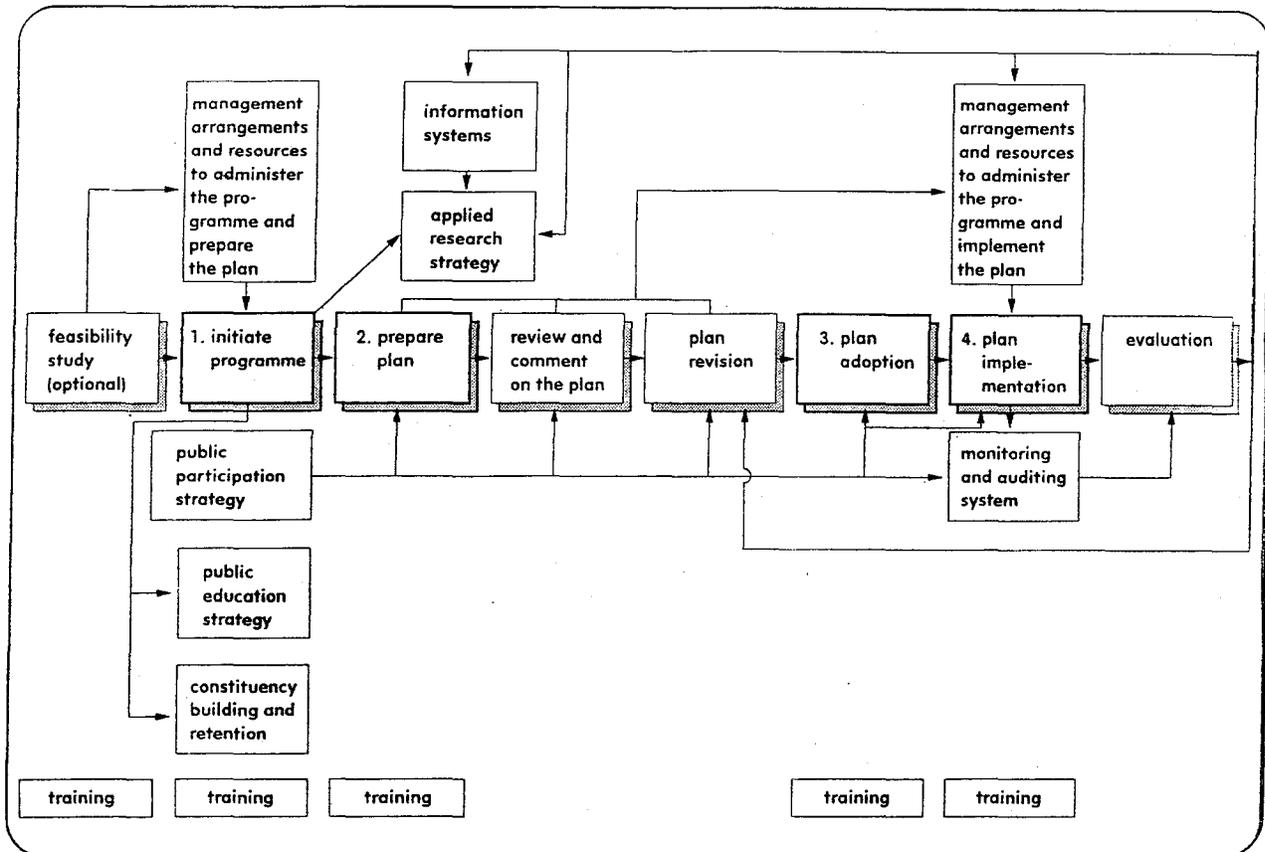
Figure 3 displays a typical arrangement of the components for a generic CZM programme. At the core, there is a three-stage programme design and development process (marked 1, 2, and 3) and a fourth final implementation step.

A major defect in Figure 3 is the absence of feedback loops or linkages between programme stages and the evaluation component which is preferably a recurring element built into each major segment. The figure also lacks provision for reviewing, updating and revising the plan on a regular basis. New information, new techniques, and changes in policies will necessitate revision after a number of years. If a regular review and revision process is not undertaken, the plan will inevitably become outdated and lose credibility with technicians, political leaders, and the general public.

A more detailed presentation of a programme development process customized to the Wider Caribbean case is found in Chapter 4.

### 3.4.3 Jurisdictional Boundaries

The interplay of multiple, often overlapping jurisdictions of various functional units and hierarchical layers of government -- each with some functional link to a segment of the coastal landscape and seascape -- requires careful attention. A simplified graphical display of this jurisdictional variation is found in Figure 4. Government involvement varies significantly within different parts of the coastal zone, which further complicates the integration task.



**Figure 3. The Basic Components of A CZM Programme (source: Awosika, *et al.*, 1993).**

NB. This figure presents, for some observers, insufficient information on the dynamics of any CZM programme. Because its emphasis is on displaying the temporal sequence and relationship of component elements of a standard CZM programme, this diagram does not portray the relative or comparative significance among components and avoids the display of complex, secondary feedback loops. By design, the diagram provides no identification of cyclic or repetitive aspects of various planning and operational functions. These are covered in Chapter 4 text and in Figures 5, 6, 7, and 8.

### **3.5 Advantages and Obstacles to ICAM**

As previously noted, managing complex systems like those in the coastal zone works only with an integrated approach which brings together overlapping, often competing interests from government, the private sector and the public. This sometimes can be acrimonious as individuals and organizations, set in their ways, do not easily or readily perceive the reasons for joint problem solving or perceive much advantage in even participating in discussions of things external to their interests.

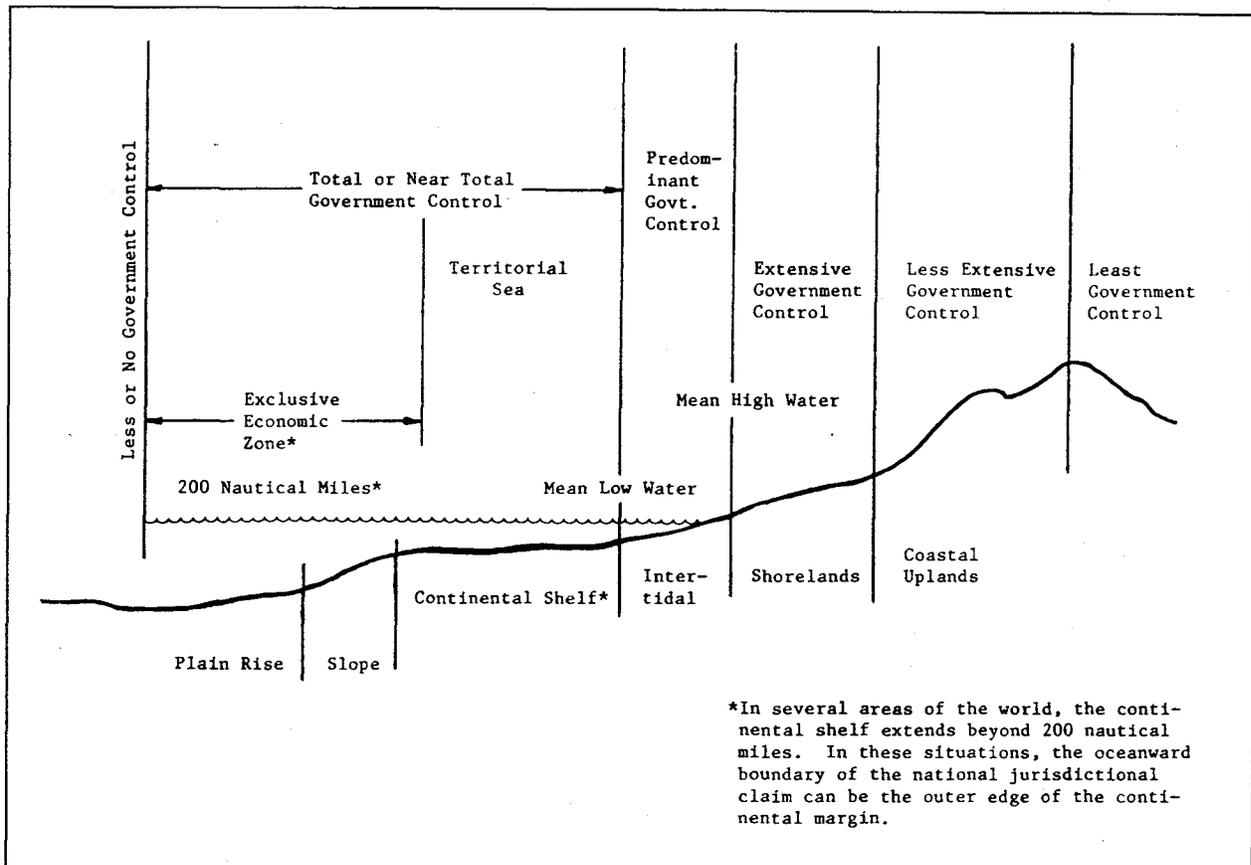


Figure 4. The Extent of Government Control with Regard to the Management of Marine and Coastal Resources (source: Sorensen, *et al.*, 1984).

Narrow sectorial solutions remain unchallenged and can even succeed indefinitely by transferring a nuisance problem (for example, the illegal discharge of waste) to another jurisdiction or sector. These kinds of interests tend to resist more rational problem-solving and conflict-resolution solutions through an integrated management approach. Yet this need to bring sectorial activities together at a common table to achieve a commonly acceptable coastal management framework is fundamental. It is also difficult. Interest groups that have previously used coastal resources as their exclusive right will generally fight to continue to do so.

As pressures increase, problems can no longer be transferred. The transfer of coastal erosion downshore or water pollution downstream are not acceptable solutions to coastal conflicts. Mechanisms have to be created with economic and social systems to ensure that environmental costs are incorporated into economic evaluations and not passed on to other areas or to future generations. These mechanisms will need to fit the complexity of coastal systems, and will include regulatory and control measures (particularly land and sea use planning) and economic instruments.

Resource conflicts nearly always are rooted in human activities and with the severe and mushrooming competition for access, space and use privileges in the coastal zone, the task of finding rational solutions through integrated planning under ICAM appears at first to be overwhelming, if not hopeless. But an open, integrated process like ICAM has a hidden dividend -- it brings sectorial allies to the table as well as sectorial opponents. And the process of education, attitudinal change, and persuasion becomes less formidable and more feasible, in part, because it is more logical. Public participation in this process also has advantages to the ICAM protagonist as supporters of the "resource" at risk can usually be enlisted in this process.

The number of government planning activities, mostly sectorial, that impinge upon or have some type of interest in or limited responsibilities for coastal areas in a country is usually significant (see Table 3 in Section 2.8.3). There is inevitable overlap, fragmentation of responsibility and conflict. ICAM can help clarify these competing interests and offers a neutral vehicle to help resolve the problems -- either in a partnership role with a lead sector or by negotiation for a coordinated approach leading to a joint strategy to address the issue or problem. Conflict resolution will be a developed skill of any ICAM programme staff.

Governments, in some cases with the assistance and concurrence of quasi- and non-governmental bodies and even the business sector, already study, plan and administer a variety of multi-layered planning activities, many of which touch the edge of the sea and the coastal zone.

ICAM needs to ferret out and familiarize itself with this matrix of planning goals, intentions, perspectives, and institutions. There are some shared interests. It is also likely that there will be differences -- even competition. Vested interests can be resilient, even stubborn.

There will also be, as another challenge for ICAM, a fragmentation of responsibility and perhaps some conflicts, not with ICAM but among the various government planning entities. Conflict resolution skills will be among those that are most scarce, yet most needed by ICAM planners and managers.

Fragmentation among planning agencies and even among some management entities necessitates integration -- integration between environment and development (sustainable development), integration among sectors, integration among ecosystems within the region. It has been argued that the best route to sustainable development lies in the direction of integrated resource management -- and an ICAM programme is an excellent learning vehicle in this regard.

There is, however, a risk of over-reaching, in the search either for ICAM programme acceptance by the public or for an environmental cause larger than the coastal zone -- like national sustainable development. Despite the temptation, ICAM needs to avoid becoming (and avoid being perceived as) a national, all-pur-

pose environmental planning and management unit (although it might become part of one, a new environmental ministry for example).

### **3.6 ICAM and National Development Planning**

One of the major challenges in the development of an ICAM plan is to relate it to and integrate it with existing planning programmes. Many nations practice four types of planning that will directly influence the shape and direction of any ICAM planning effort: national economic planning, sectorial planning, land use planning, and special area planning.

While varying slightly from place to place, national economic or development planning distinguishes itself by being countrywide in scope and by shaping and setting various state (and sub-unit) developmental goals, some in economic terms. It does this by sector, and by region in a larger country, aiming to increase economic growth, encourage investment, reduce income disparities, create employment, enhance foreign trade (and exchange) and safeguard the general welfare of the population.

From the perspective of coastal resources, the ultimate objective of an ICAM programme is that it will become a functioning (and continuing) part of the national development planning process. By doing so, it would enable ICAM to reduce the negative side-effects of prejudicial development activities by other sectors or areas (for example, industrial wastes into estuaries or farm agrochemicals into upper watershed stream corridors). Even more positive would be things like the creation of a degree of certainty about coastal land development or the enhancement of national shore-protection measures.

The downside is that national economic plans lack flexibility, tend to be mechanistic, conservative and unimaginative about things like urban waterfront renewal, marine industrial parks, marine recreation facilities, marine ecotourism, and so forth. These are the very things a forward-looking ICAM programme could engineer with the private sector and a creative urban or regional development commission seeking imaginative and productive ways to cluster compatible uses in a waterfront zone.

### **3.7 Sectorial Planning**

Planning by sector is so standard a practice that virtually all multilateral banks, donor organizations and bilateral assistance programmes have structured the major portion of their investment and grant-supported activities along sectorial lines. Within the Wider Caribbean Region, sectorial planning traditionally combines forecasting for capital investment requirements, physical planning, infrastructural

needs assessment and implementation, including dialogue with donors, investors and developers. Sectorial planning sometimes mirrors national economic planning but with a special topical or thematic focus -- on agriculture, on tourism, on transportation, on health, on education and so forth.

For most countries in the Wider Caribbean Region, the sectors with the greatest economic relevance to coastal management are fisheries, transportation (or ports), forestry and tourism (see also Table 2). The sectors with the most environmental impact on coastal resources are agriculture (because of sedimentation, agrochemical runoff and mariculture), mining (because of petroleum), industry and commerce (because of hazardous and toxic materials), and whatever sectorial planning unit large coastal cities fall under (because of solid and liquid waste streams). Most of these sectors have some dependence on an efficiently functioning natural resource base. Thus, ICAM's success will depend significantly upon changes in attitudes and perspectives among the sectorial planning contingent (Examples of the issues requiring sectorial-ICAM policy coordination can be found in Box 3).

Several nations have recognized the importance of environmental factors and have taken steps to include them in "broad-scope" sectorial planning. In the Northern Caribbean, for example, fishery plans for individual species, prepared by the Caribbean Fishery Management Council (CFMC) under the direction of the U.S. Marine Fisheries Service (NOAA), are based on environmental system analyses that take in account sustainable yields, recruitment rates, water quality and habitat quality (Sorensen, *et al.*, 1984).

Table 2. Sectorial Planning in the Coastal Zone.	
SECTORS OFTEN SPECIFICALLY RELATED TO THE COASTAL ZONE OR OCEAN	SECTORS RARELY SPECIFICALLY RELATED TO THE COASTAL ZONE BUT MAY HAVE DIRECT IMPACTS
1. Naval and other national defense operations (e.g., testing, coast guard, customs)	1. Agriculture; mariculture
2. Port and harbor development (including shipping channels)	2. Forestry
3. Shipping and navigation	3. Fish and wildlife management
4. Recreational boating and harbors	4. Parks and recreation
5. Commercial and recreational fishing	5. Education
6. Mariculture	6. Public health (mosquito control, food)
7. Tourism	7. Housing
8. Marine and coastal research	8. Water and pollution control
9. Water supply	9. Water supply
	10. Transportation
	11. Flood control
	12. Oil and gas development
	13. Mining
	14. Industrial development
	15. Energy generation

Source: Awosika, *et al.*, 1993.

**Box 3. SECTORIAL ICAM POLICY COORDINATION**

1. Growth vectors (especially urban housing, industry, commercial centers) should be closely coordinated with utility and other infrastructural capacity limitations. Setting preliminary zonal and sub-zonal coastal carrying-capacity limits for sectorial planning guidance warrants testing.
2. Industrial and commercial siting in coastal areas (tourism, manufacturing, merchandizing centers) should reflect documented water-dependent use requirements.
3. Public access ways and "rights of way" to beaches for the public should be confirmed or acquired, developed, maintained, and access rights set as conditional requirements in all major coastal permits, including subdivisions.
4. Land reclamation requires careful interaction of engineers, environmental scientists, and planners to minimize adverse impacts on adjacent and target coastal ecosystems.
5. Public fishing facilities and boating access points on the shoreline should be folded in to domestic recreational, tourism and fisheries planning initiatives.
6. Wrecked and grounded vessel removal from shorelines and beach areas requires a cooperative understanding between public works, public safety, the port authority, legal agencies, and ICAM. Instruments should be in place as a contingency planning procedure.
7. Oil spills require a framework agreement similar to #5, with the addition of the natural resource agency or fisheries department, public health, and tourism.
8. Coastal agriculture and forestry should be the subject of three understandings between the responsible government ministry or department and ICAM regarding: (1) reduction of agrochemical non-point source runoff; (2) the positive effects of maintaining agricultural areas as open space and a desirable landscape feature preventing strip development along coastal roads and shorelines; and (3) reduction of coastal pollution from sediment runoff.

Given that most major ports are located in estuaries, port expansion is likely to affect fringing wetlands, pollute water and destroy productive benthic communities. In addition, industrial facilities conflict spatially with public recreation or commercial fishing and limit access to the shore. Port management, as it deals with the recurring issues of channel maintenance, dredging, land fill, and the handling of toxic material in bulk, is a matter of concern to a coastal authority responsible for the larger encompassing coastal zone in which the port is located.

In another sector, successful tourism development in the Wider Caribbean Region requires a mix of hotels and shops, infrastructure (water, sanitation, roads, ports), and an accessible, relatively unspoiled natural environment. These goals can con-

flict with each other and with development plans in other sectors. The relatively recent emergence of ecotourism as a sub-sector suggests that the industry's environmental excesses may in a longer perspective be diminished.

When it is well done, broad-scope, sectorial planning begins to use the language and principles of ICAM. This is a nearly ideal basis for an optimum planning relationship -- a "nested" set of compatible plans.

Broad-scope sector planning represents a marginal change from the status quo. Since institutions tend to make only marginal adjustments when confronted with the need for change, broad-scope, single-sector planning is the most likely management strategy to be implemented. For example, Colombia has developed broad-scope sectorial plans for marine and coastal research. Coordinating organizations have been established, linked to the national economic planning programme designed to develop unique Colombian marine and coastal resources.

Fortunately, broad-scope sectorial planning can and often does serve as a transition to more integrated management planning along the same lines as ICAM. If a government agency broadens its horizons to assess the full range of impacts associated with its projects, and this wider perspective produces a net benefit to the agency, this positive experience should make the agency more amenable to taking the next step towards integrated planning. The major disadvantage of broad-scope sectorial planning is the perpetuation of non-integrated, single-purpose programmes.

The process of change from narrow to broad-scope sectorial planning is greatly enhanced and accelerated by a national requirement for environmental impact assessments for all new, medium to large projects and programmes, assuming the procedure more or less meets international standards for scoping, formats, coverage, documentation, and review of alternative scenarios.

There are some land-based practices which impinge on coastal areas:

### **(1) Urbanization**

Coastal cities dominate both population and economic growth in much of the Wider Caribbean Region. Growth impacts and waste streams from these expanding urban areas are leading to serious environmental degradation -- in particular, water pollution. Public institutions for managing waterfront development, population expansion, industrial effluents, and municipal waste discharges on land and in harbors and estuaries have been overwhelmed by the dimensions of urbanization, and management failures are common.

Additionally, rapid tourism growth, with high-volume waste streams and a preference for seacoast locations, and inappropriate land development control practices generally combine to make the problems of urbanization even more difficult. ICAM

technologies for Wider Caribbean harbor cities are therefore both a pressing and especially challenging task.

## **(2) Fisheries**

Often housed within a ministry of agriculture with its own marine experts and biologists (seldom ecologists), its own tradition of sustainable-yield sector planning, and its own government subsidies (e.g., research, duty-free gear), fisheries units tend to feel isolated, act independently, ignore overharvesting signals, and will often oppose inshore *ecosystem* management which would constrain, if not eliminate, overfishing and even -- as in Bermuda recently -- prohibit all pot or trap fishing for reef species, thus shifting the effort and emphasis to demersals and offshore shelf stocks caught by more selective handlines, deep set traps and long-lines.

## **(3) Public Sector Enterprises**

Government corporations engaged in or linked to resource management or resource harvesting enterprises, like agricultural marketing boards, cooperatives and other government-run enterprises, traditionally lack an interest in and funds for serious environmental protection measures. ICAM's concerns for excessive upland and shoreline application of agrochemicals, for example, will not be universally popular with such public sector enterprises. Privatization of these, however, is being encouraged by most of the multilateral banks, with as yet unknown implications for coastal environments.

## **(4) Agriculture and Forestry: Watershed Management Problems**

Although somewhat removed from the coastal zone in larger countries, watershed areas involved in production forestry and agriculture are nonetheless a problem. Eroded sediments and agrochemicals from upland areas, in combination downstream with urban run-off and its nutrient loads, are threatening and sometimes literally killing coastal reef, seagrass and mangrove systems.

Non-point source pollution, treated as an externality by agriculturalists and foresters, needs to be brought under control in Wider Caribbean countries, and ICAM needs to be ready to assist. Again, agriculture is one of the most significant but not the only offender, as unpaved roads (the responsibility of public works ministries) are big-time losers (of sediments) which eventually reach coastal ecosystems. Actually, unpaved roads on steep slopes with regular vehicular traffic are the worst offenders, but it is impossible to identify a single "sector" as the offending authority.

### **(5) Mariculture**

Mariculture is not a major coastal player in the Caribbean, although maricultural activities -- again, often under the aegis of a ministry of agriculture -- are found in perhaps half the countries in the region, including some important areas of shrimp farming in coastal regions. Problems associated with this type of activity are destruction of mangroves and changes in water fluxes and current patterns. It is important that a proper management plan be in place before mariculture activities are undertaken, in order to avoid the destruction or degradation of coastal resources.

As these brief reviews of five, perhaps atypical, sectorial interface problems suggest, ICAM managers can expect some delay in the search for an accommodation with sector planners who tend to narrowly define their domain.

## **3.8 Land Use Planning**

Land use (or physical) planning is carried out at both national and local levels. Normally accompanied by a set of regulations, the land use planning process sets the type, intensity, size, and rate of development and protection or conservation for a specified area. Most coastal zones, most urban, residential and town areas are covered by land use plans with broad goals and objectives designed to shape planning decisions. Plans, guided by definitions and standards, usually come with zoning maps which make use of designations by class (e.g., residential, commercial) for each numbered and mapped land parcel.

Several countries in the Wider Caribbean, as former colonies, know land use planning as town and country planning, a tightly structured and orderly inventory, survey and land allocation process leading to the production of maps for local political jurisdictions. Also included are outlines of anticipated changes including proposed infrastructure development and phasing schedules. This leads to a public vetting followed by recommendations to the relevant Minister for approval (this is sometimes the director of the planning agency who reports directly to Cabinet). In the smaller Eastern Caribbean islands, this process has been significantly abbreviated in many plans where the town and country planning office has functioned as a planning secretariat for the Prime Minister's Office or the Cabinet, with little or marginal community involvement. This system does not deal easily with waterfront development, coastal systems, submerged lands, shoreline dynamics or hurricane impacts.

At least three countries on the rim of the Wider Caribbean have amended or modified their town and country planning programmes to shape new policies for land use controls within a delineated coastal area (Awosika, *et al.*, 1993):

- o The Bahamas prepared development plans on an island-by-island basis, treating coastal areas as a separate planning area.

- o Jamaica prepared a plan for coastal management which endorses "... the evaluation of sensitivities and classification of areas of environmental concern."
- o Guatemala has provided a different approach, in a shoreland use planning strategy wherein the coastal area extends three kilometers inland from the seashore and is treated as a separate, special zoning area.

A new approach -- overlay zoning -- is being used to guide planning for sensitive areas, i.e., those needing extra protection, by the imposition of special restrictions (such as setback requirements or retention of wetland habitats). These extra requirements are in addition to existing standard regulations. An incentive strategy has also been used to facilitate cluster zoning or a land use designation that permits greater densities for certain types of development on coastal frontage, thereby encouraging investment and development of high priority recreational and commercial facilities (a public fishing pier, for example, as a recreational structure).

Land use (or town and country) planning provides a reasonable mechanism for resolving land use conflicts arising on a shoreline or linked to inland activity that affects the coastline. What is essential in this context is strong zoning with few loopholes, as well as standards for pollution emissions and other kinds of control measures to reduce coastal degradation. Programmes organized at the national level provide an opportunity to deal with conflicting multiple-use circumstances in a consistent manner. Precedents for experiences in another area can be instructive.

Once an ICAM programme is planned, a strategy for opening a cooperative dialogue and establishing a working relationship with the local and national land use planning officials is very important. ICAM needs to see stronger planning policies as a positive contribution to the mission of coastal protection. With overlay zoning, the special needs of ICAM can be served in special cases as a retrofit or export situation. *In fact, the ideal situation is for the ICAM process to be included in the land use planning process as an integral part.* In particular, this applies to the smaller island states and territories in the Eastern Caribbean where the entire island can be considered a coastal area.

### 3.9 Special Area Planning

Special area plans are for areas, issues or programmes smaller than the nation but larger than a single local jurisdiction. The distinguishing feature of these kinds of plans is geographic scope. The boundaries are usually intended to capture:

- (1) A specific resource or issue (like pollution) or transport network or distinctive feature (like a park or protected area) that crosses one or more administrative state or local boundaries; or
- (2) A significant *natural* resource such as an embayment, a river basin, an estuary, or a mangrove system.

They can be single-issue or multi-issue driven. They are becoming very popular with the rising interest in landscape features like estuaries, watersheds, or biosphere reserves (see also Section 5.2). They might even focus on coastal forests or a subterranean cave system.

Most special area planning programmes and products have a landward focus and seldom address water-related issues. One exception to this is the APC (Area of Particular Concern) planning strategy employed under the U.S. Virgin Islands CZM Programme. Another is Puerto Rico, where a new special area estuarine management planning initiative is underway for San Juan Harbor and its estuarine environments. This is being done under an experimental, multi-agency estuarine management programme.

Within an international special area context, it is possible to address and resolve problems faced by entire ecosystems, such as a shared trans-boundary resource (for example, migratory sports fish). Very often these issues cross a number of jurisdictions and can only be effectively addressed with a regional geographic focus. Coastal management institutions organized at the regional level often present opportunities for local authorities and officials with responsibility in various sectors to cooperate and resolve common problems. A small-scale programme can serve as a model that can be tested, modified and perhaps extended to other regions.

### **3.10 Coastal Planning and Disaster Mitigation\***

Coastal areas present a genuine planner's paradox. They are among the most attractive for new development, especially in the tourism-driven economies of the tropics, but the siting of facilities along the coast will increase the exposure of people and property to the cumulative impacts of coastal storm damage. Public and private sector investment alike tend to cluster in high-risk concentrations close by the sea, on urban and suburban coastlines, on exposed headlands, and even in the high-risk lowlands situated landward of almost any extended system of

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\* Portions of the following section were adapted from: Brower, D., T. Beatley, and D. Blatt, 1987. *Reducing Hurricane and Coastal Hazards Through Growth Management*. Center for Urban and Regional Studies, University of North Carolina at Chapel Hill, USA.

beaches. Yet public policy in most Caribbean countries, continental or insular, does little to discourage development in hazardous areas along exposed coastlines and flood-prone estuaries. On occasion, it may inadvertently encourage the practice.

It is difficult to explain this compelling pull of the edge of the sea but it is real and pervasive and growing. For some, of course, it's the urban community, employment and city life, not the sea, that is the attraction. But for the coastal planner trying to identify and set aside coastal sites for truly water dependent uses (like marinas, resort hotels and recreational watersports facilities), the competition is fierce and user conflicts are inevitable as investors seek to develop ever more exposed and vulnerable sites, passing the risk along to an uninformed buyer. This disproportionately rapid growth of population in coastal areas makes high density coastal areas more vulnerable to disaster than many inland areas.

Land use planning and development management, when done together and informed by sound marine engineering advice, can, in fact, shape growth in coastal areas sufficient to offer government officials a practical and feasible way to mitigate the destructive effects of hurricanes and other severe coastal storms. Where coastal planning and the development control process are well informed and effective, developing coastal areas can be orderly, highly productive zones of rationed benefits and managed competition providing steady flows of enhanced revenues for the state. Conversely, where there is no such vision and no mitigation planning, and the coastal zone remains unmanaged, public sector revenues diminish and the full potential of this otherwise valuable resource will remain unrealized.

### ***3.10.1 Coastal Hazard Mitigation As A Policy Issue***

Both public officials and private developers confront the dual task of making the coast accessible to the people while protecting them from the dangers of coastal storms. The policy challenge lies in striking the appropriate balance between coastal development and hazard mitigation, between economic growth and public safety. Conflict can occur when governments attempt to implement programmes that intervene in the market and even restrict private property rights in order to guide development into safe patterns and protect the resource user/consumer.

A hurricane or severe coastal storm in an undeveloped area affects only the natural environment; for a disaster involving injury, death, and property destruction to occur, there must have been human decisions to develop hazard-prone areas in the path of potential storms. Otherwise such natural events would have more limited consequences. Three types of coastal storm impacts argue for government intervention into coastal development processes:

- threats to public health, safety, and welfare;

- costs to taxpayers for disaster relief and protection; and
- losses of irreplaceable natural resources.

All of these impacts can be reduced by enacting and implementing effective public coastal storm hazard policy.

Concern with natural hazard mitigation policy is relatively recent. To understand the relationship of mitigation to other disaster management activities, it is necessary to review the accepted natural hazard management model. This conceptual model consists of a four-stage process centered on an emergency event or disaster, such as a storm. These stages taking place before the disaster are termed the mitigation and preparedness stages; those after the response and recovery stages. In practice, the stages are not distinct. For example, mitigation overlaps preparedness and recovery.

***Mitigation*** includes long-term actions to prevent, avoid, or reduce the impacts of a hazard. Mitigation takes place both before a disaster strikes and during the recovery phase after a disaster in anticipation of the next disaster. It is aimed at reducing the vulnerability of both people and property to injury from the hazard. It lowers risk.

***Preparedness*** includes the short-term activities undertaken after a disaster warning is received, such as evacuating exposed populations and attempting temporary property protection to save lives and reduce disaster damage.

***Response*** includes the short-term emergency aid and assistance actions following the disaster strike. It is aimed at search and rescue, provision of food, shelter, and medical facilities, restoration of public services, removal of health hazards, and clearance of debris.

***Recovery*** includes the immediate support necessary to restore minimum operating conditions and the longer-term actions to return the community to normal. Recovery combines rebuilding with opportunities for community efforts to learn from the experience and by the application of tighter, more focused development controls to reduce the risks of future damage in the coastal areas.

### ***3.10.2 Risks and Mitigation***

Risk management (discussed in Section 5.6) can provide only probabilities of risks occurring and only broad estimations of their consequences. Oil spills are a good example. Three steps can be distinguished in the risk management procedure: (1) identification of major hazards, (2) assessment of the potential of individual haz-

ards, and (3) formulation of a plan that integrates the various management approaches to risks.

Mitigation of *risks from hazards due to industrial, energy, transport and other activities* is normally based on a multidisciplinary approach which takes into account all types of hazards existing in a special coastal area. A specific method for dealing with industrial risks, APELL (Awareness and Preparedness for Emergency at Local Level), has been developed by UNEP. The main responsibility for carrying out within ICAM the three steps in risk management specified above lies at the sub-national and local level. For broad risks like oil spills, national authorities should be responsible for overall coordination, and institutional and legislative aspects. ICAM personnel should be active partners in this process to reduce shoreline and shore-zone damages.

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## CHAPTER 4.

### DEVELOPMENT AND IMPLEMENTATION OF ICAM PROGRAMMES

This section outlines a model process for developing and implementing an ICAM programme. It is a prototype approach which may be difficult for many countries to fully emulate. Nevertheless, this section could serve as preliminary guidelines for countries in the Wider Caribbean Region seeking to improve existing coastal area management programmes. It is not intended to meet the requirements of all, nor is it suggested that each step must be followed exactly as presented.

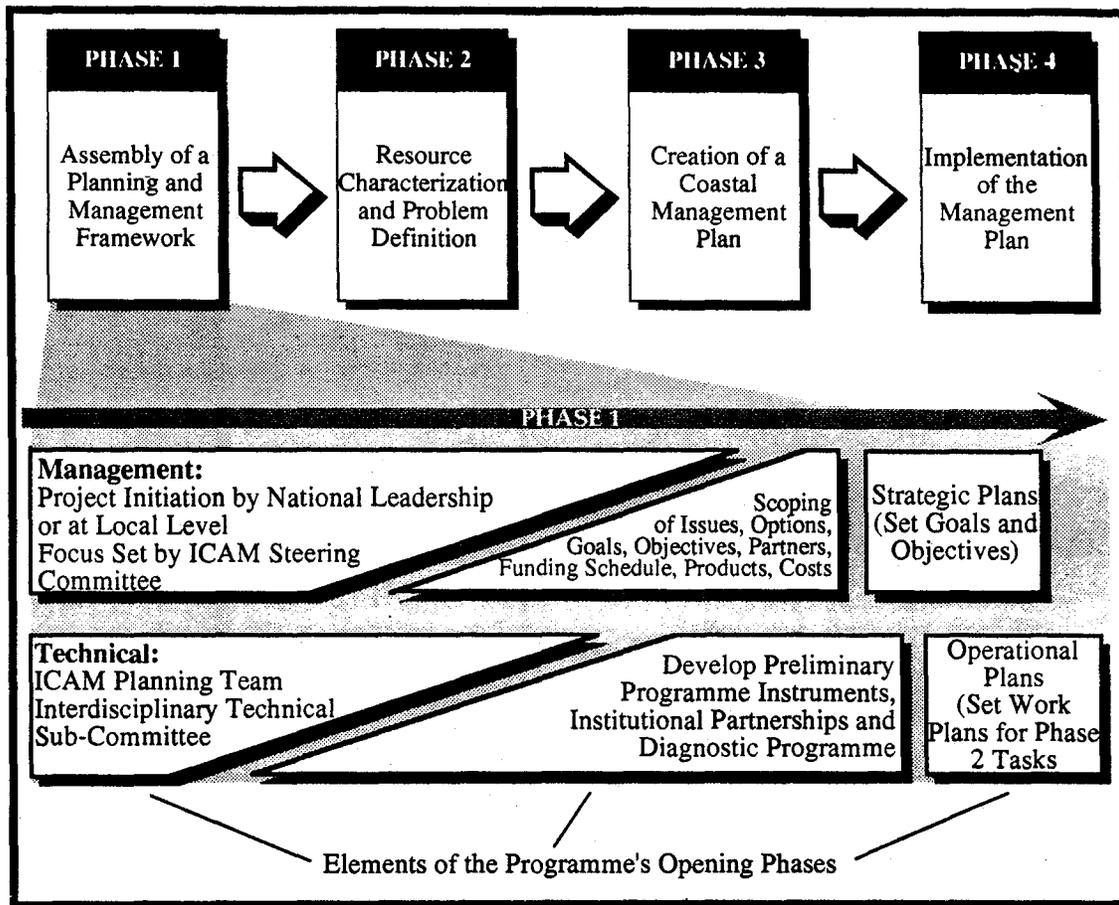
A four-phase process is suggested for the development and implementation of ICAM programmes; each phase is presented in detail in the four sub-sections which follow.

- |         |  |
|---------|--|
| Phase 1 | Opening or programme initiation phase during which the programme focus is set, issues reviewed, goals and objectives established, and preliminary planning and organizing efforts are put in motion. |
| Phase 2 | A programme analysis phase during which a number of parallel investigations are carried out which determine what problems will be addressed and what actions are needed under the ICAM programme.    |
| Phase 3 | A programme design phase during which a coastal management plan and related planning tools are assembled.  |
| Phase 4 | The final phase during which the coastal management plan is implemented, with ongoing provisions for programme evaluation and modification.  |

#### 4.1 Programme Initiation: Phase 1

There is a general agreement among coastal area programme specialists that there is no unique best scenario for the start-up and implementation of a new coastal area management programme, integrated or otherwise. In several case studies done antecedent to World Coast 1993, the International Conference on Coastal Zone Management held in the Netherlands, it was evident that a wide variety of successful programme initiatives exist but that they differ widely. In fact, it was "... evident that the most important lesson to be learned about ICZM [Integrated Coastal Zone Management] arose from the differences between successful approaches" (Awosika, *et al.*, 1993).

This is, of course, a favorable finding as it suggests there is a reasonably broad set of tactical options, tools and approaches that the would-be coastal programme



**Figure 5. Elements of Opening Phase for An ICAM Programme: Phase 1.**

*NB. Each phase presumes and requires regular dialogue with stakeholder groups and local community leaders.*

planner can choose from, selecting those that appear best suited to local conditions and circumstances. However, this also suggests the need for a pre-project review of what has worked elsewhere and under what specific conditions comparable to those prevailing locally.

This section outlines some of the pre-start up optional activities that have proven effective as first-stage, constituency-building and energizing procedures for the development of ICAM programmes. See Figure 5.

#### **4.1.1 First Steps: Preliminary Tasks**

Developing the *idea* for improved coastal area management in any particular country or local administration, by persuading that country to restructure itself in favor

of a new integrated approach to coastal system planning, is a relatively easy task. This task is especially easy if coastal zone resources are in difficulty and there are unresolved problems that adversely affect beach goers, tourists, fishermen, boat owners, hoteliers, and so forth -- in other words, people who expect to enjoy or to profit from the use of coastal resources. These people are relatively easy to persuade that the "idea" is a good one, and that it will lead to better planning and management, and more order and fewer losses.

But development of the idea inside the government structure by those technically in charge of the coastline or coastal resources is more difficult, as changing the *status quo* generally is.

(a) **ESSENTIAL PREREQUISITES (OVERVIEW)**

**First**, selecting and legitimizing the initial leadership "team" -- for the complex task of explaining and justifying to the national government the need for rethinking, re-arranging and, when necessary, reforming its approaches for managing the coastal zone -- is at best a complicated business, not unlike the assembly of a team trying to elect a winning reform candidate to public office. The analogue can be instructive.

**Second**, institutional (organizational) support arrangements are of vital importance from the outset for the planning phases of programme development. These arrangements are critical for issue identification, for improved technical inputs, and for enhancing public perception about the integrity and legitimacy of the endeavor.

**Third**, it is important to establish government's formal approval by its authenticating the legitimacy of the antecedent study and planning effort as part of a process that leads to a formal plan of action. The formal plan is destined to be presented for review and approval by a high-level unit or branch of government, such as the cabinet or parliament, as well as by the local coastal authorities. This does not have to be accomplished at the very beginning of the process but could wait (1) until a strategic moment or (2) for establishment of sufficient programme credibility to gain government endorsement.

**Fourth**, it is important to develop a stakeholders' strategy by bringing coastal area land and facility owners, resource users, and coastal interest groups, including local authorities, into the dialogue concerning programme design and development.

**Fifth**, it is important to develop a public awareness strategy to both publicize and upgrade the agenda of relevant coastal "issues", and to build a constituency among non-stakeholder communities by facilitating their direct involvement in both the planning process and subsequent implementation and monitoring.

**(b) INITIAL LEADERSHIP: THE ICAM STEERING COMMITTEE**

The initial leadership team (established as a steering committee) can be either formally or informally constituted, and could be appointed by a senior government official or be sponsored by a relevant ministry or agency (e.g. a national or regional planning commission, for example). The sponsor could also be a group of volunteers assembled under the aegis of an appropriate institution, such as a marine research institute or university. The leadership team needs to have broad expert representation from government, industry, academia, tourism, shipping, fisheries, selected coastal communities and user-group institutions, the port authority, and national, local or regional planning units.

The original stimulus could arise from coalesced local coastal interests, aggrieved or not, or from national interests (political, economic, environmental). Such a team should ideally reflect a bias toward being multidisciplinary, a mix of practical and theoretical, engineering and policy. It should not be too large, and technical experts can be attached on an *ad hoc* basis as needed. Its primary function is as a steering group and a recruiting vehicle to enlist counsel, logistical support, advice, and input from a broad spectrum of the community, tapping its resources to make the undertaking a broad, community-based joint undertaking with government.

While it might be assumed there will be *one* national steering group which will be convened to lead the planning effort, this is a decision that needs to be made in each country. The steering committee's workload may be greatly eased if local institutions carry some of the burden. For smaller island countries, a single national steering committee or commission would be sufficient. It would probably operate with a technical sub-committee, as a special working group.

For larger countries, and especially the continental countries in the region, a national steering committee or commission might divide its work with a separate, more senior policy committee, comprised of both political leaders of major national departments, ministries or semi-autonomous agencies, as well as state, provincial or local leaders. A more junior technical planning group or sub-committee could be assembled to provide drafting and review counsel. Again, these determinations will have to be made in each target country.

One of the more important first tasks of the steering committee organizing the ICAM programme is to assemble a tentative but broad list of coastal and marine resource management issues, both documented and perceived. Input should be informally solicited from the committee's own members and from a reasonably small group of coastal and marine experts, leaders, scholars, and professional planners.

Sorensen, *et al.* (1984) identified four types of issues that can be useful:

1. *societal demands* for the goods and services produced in the coastal zone;
2. *conflicts between users*, e.g., the drainage or reclamation of wetlands, dredging of harbors for the development of tourism facilities, or inadequate treatment of sewage wastewater may result in damaged reefs and reduced fish stocks;
3. *the effects of non-product outputs on the state of the natural system*, e.g., coastal hazards caused by natural processes (shore erosion, hurricanes, river flooding, landslides) may affect human survival and may destroy all types of development;
4. *opportunities*, e.g., development and/or planning needs, such as mariculture development plans, infrastructure for tourism development, planning processes for the privatization of coastal lands.

Converting the findings into a consolidated and ranked priority issues document is the next step which should be done as expeditiously as possible so the draft list can be circulated among stakeholders, government officials and others for a further refinement and expansion. Following this, the document then become the basis for broader circulation for public review and discussion. Ranking procedures for selecting priority issues should include estimates of the following:

- the quantifiable and non-quantifiable costs arising from the issue;
- the distribution of costs among sectors of society;
- the time and budget required to resolve the issue (such as for data collection and information analysis);
- the likelihood that the issue will be resolved in a relatively short time (one or two years) if an adequate budget is allocated.

Once this is done, the universe of issues can be used to shape the scope of the ICAM strategic plan, to define information needs and to help set programme internal and external boundaries. This is discussed in more detail in Section 4.3.

Issues, once identified and ranked, have special value as programme evaluation tools. They form a map of intended achievements, namely, the resolution of the issue or at least its amelioration.

#### **(c) THE PRELIMINARY OR ADVANCE PLANNING TEAM**

In order to facilitate coordination for ICAM planning, a planning team, under the ICAM steering committee, should be established and assigned responsibility for the actual work of the committee -- in effect, a working secretariat. This team would

be responsible for the practical coordination of input and assistance from cooperating institutions, agencies and other sources of expertise. The composition of the planning team could include, among others, a marine biologist, a physical planner and a marine engineer, plus draftsmen and secretarial support.

**(d) SUPPORTING INSTITUTIONAL ARRANGEMENTS**

Quasi- and non-governmental institutions, such as marine and coastal research facilities, academies of science, and university marine science and engineering units, have the expertise, the information base and flexibility to make substantive contributions to the ICAM planning initiative. They have an interest in influencing the study agenda of the ICAM programme and in helping define the issues of ICAM. Cooperative arrangements with such institutions are often facilitated by the establishment of a technical sub-committee under the aegis of the ICAM steering committee.

**(e) GOVERNMENT INVOLVEMENT**

The level of active participation by government in initiating or developing a coastal management programme depends largely on:

1. The extent to which the government controls and is perceived to be in charge of decision making about non-private (i.e., common property) resources in the coastal zone.
2. The extent to which government has taken an active role in promoting and supporting marine and coastal research institutions and programmes.
3. The extent to which a political leader (or leaders) within government can be identified who is (are) already an active user(s) of the coastal zone (e.g., fisherman, yachtsman, marine scientist, maritime lawyer, etc.). Such persons should be recruited for active participation, and a possible leadership role, in the effort.

It is noteworthy that a recent global programme review suggests that for currently active coastal area management programmes, there is "an increasing balance between government and local leadership as they evolve, regardless of how they are initiated (Awosika, *et al.*, 1993).

Geographic setting seems to have some relationship to whether the initiation of ICAM programmes is top-down or bottom-up. All of island nations examined in case studies for the World Coast Conference, 1993, featured a top-down approach, although the first initiative could have been provided by local groups. In Barbados, for example, the local initiative -- inspired by concerns about the linkage

between pollution, beach erosion and coastal coral reef degradation -- was taken up by the central government which borrowed from an international development bank to finance the development and implementation of a first-stage coastal conservation effort.

In the Dominican Republic, the National Planning Office initiated efforts to develop a National Plan for Managing the Sea Coast Area in close collaboration with other official governmental institutions. During the diagnostic phase, the coastal zone was divided into 13 sectors, on the assumption that this would provide a methodological planning framework for integrated coastal area management. Planning activities are presently underway in a section of the coastal area east of Santo Domingo.

The initiative stems principally from national authorities, but it is acknowledged that the ICAM planning process needs to incorporate a broader participation of local-level authorities and non-governmental groups. It is fair to say that any integrated coastal area management programme should reflect a balance of top-down and bottom-up approaches within the planning phase itself.

**(f) STAKEHOLDER INVOLVEMENT**

Coastal area stakeholders have a strong interest in the viability of the coastal zone -- their livelihood or other kinds of economic "stake" depends on it. This group includes landowners, resort hotel operators, fishermen, commercial and industrial "tenants", and others. But how significant is their economic dependency, how big is their investment interest in the coastal zone? Until this is known, it is difficult to ascertain issues, assess need and set a strategy to protect the basis for the area of concern.

In most national and local coastal management programmes, the stakeholders who are most likely to be affected by government policies should play the most significant role in their formulation and implementation. The involvement of stakeholders will also help to ensure that the planning process makes full use of existing expertise and knowledge, particularly at the local level. The stakeholders must help generate the "political will" to take action among government policy makers.

The stakeholders may be well organized, such as parastatal organizations and conservation groups, or less well organized, such as landowners, ethnic groups and social classes. Particular effort may be needed to involve rural and subsistence communities who are usually unorganized or have little or no experience in communicating their problems and concerns to local -- let alone regional or national -- government representatives. NGOs participating in ICAM can assist in this case as interested intermediaries.

The involvement of stakeholders, as well as non-stake holder communities, in the ICAM planning process will create a feeling of responsibility among these groups, not only for a successful outcome of the planning initiative but, as important, for plan implementation and monitoring in the future.

#### **4.1.2 Public Support**

Behind most coastal area planning initiatives, there usually lies an antecedent environmental crises of some type, sometimes a rash of storm/erosion events, even coastal flooding, perhaps due to excessive beach sand mining and protective dune lowering. Sometimes it is not a catastrophic event but a series of sequential, incremental yet unpleasant and damaging changes -- like disappearing wildlife, diminishing fish yields, reduced water quality or harbor siltation. The initiative could also stem from the expressed intention of a developer to undertake a major investment project in an area which had been relatively free of development pressures and impacts. Such events, over time, build community uneasiness and concern at apparent mismanagement by responsible public sector officials and private sector polluters.

Arranging for a publicly mounted overview survey of such deteriorating conditions, in the guise of a coastal resource environment status report, can provide a vehicle for bringing the condition of the coastal resource base to the attention of the media and the public. Unanticipated events like coastal oil spills, fish kills and hurricane damage of the shoreline's natural and built environments can also be used to point up inappropriate planning decisions and institutional inadequacies for dealing with these and similar kinds of resource management problems.

In a slightly different vein, starting a coastal area management programme customarily involves a variety of inventory tasks early in the planning phase. Lists of skilled cartographers, scuba diving establishments, available academic specialists and other professionals with a coastal-related specialty represent but a few of the types of simpler inventories. For the more resource focused surveys and those that are more difficult and ideally more controversial (because they are more visible), the enlistment of help from the public should be encouraged -- for example, using NGOs, citizen interest groups, students, or other small community organizations of volunteer private citizens. A national wetlands resource survey can bring out the country's bird lovers, as both field workers and data analysts. A survey of marinas or marine industries can be of interest to private sector boaters, yachtsmen and fishermen, all of whom might be enlisted to help.

The important point is that mounting a public survey of a resource that is in trouble or of interest to a segment of the general population can be an excellent public information tool with which to publicize the ICAM programme and its objectives.

Many current integrated coastal area management programmes were launched on the basis of a major antecedent, well publicized, damage assessment, resource study or "crisis report" that was widely disseminated as a pre-programme justification document. The United States, Great Britain, Sweden, France, the U.S. Virgin Islands, and Puerto Rico each had the benefit of such a document lending credence to the case being made for a new coastal zone or coastal area management planning initiative. The evidence is clear. Such antecedent studies help immensely and can be done inexpensively as a community-based "futures" planning exercise aimed at conserving natural resources and protecting coastal ecosystems from further injurious impacts.

#### **4.1.3 Goals \***

Setting down on paper the goals of the overall coastal and marine area resource planning and management process is not an easy task. The overall goal of most ICAM programmes is to:

1. ensure optimum sustainable use of coastal and marine natural resources;
2. ensure perpetual maintenance of high levels of biodiversity consistent with traditional natural conditions;
3. conserve critical habitats; and
4. maintain ecosystem integrity.

Compatibility of goals for adjacent countries is an obviously desirable objective, as shared ecosystems and habitats are inevitable.

Goals are customarily compatible, complimentary and hierarchical (i.e., global, regional, national, local, sectorial); they are therefore nested. Once formulated, programme goals should be approved at the highest level of government. Examples of model ICAM goals and strategies, as developed by FAO, are presented in Box 4 (FAO uses the term "strategies" interchangeably with "objectives" in their list).

#### **4.1.4 Strategic Planning \***

For most planners, strategic planning is the process by which one arrives at a set of several objectives designed to accomplish or contribute to a given task or desirable end or goal, without working at cross purposes with other goals or objectives.

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\* This item requires a repeat process for cyclical upgrade, revision and feedback as it serves as an ongoing, periodic or continuous input to the activities in the ICAM process.

**Box 4. EXAMPLES OF ICAM GOALS AND STRATEGIES \***

**Maintain A High Quality Coastal Environment.** The coast is a major national resource, providing commerce, food, recreation, spiritual refreshment, and security. These values will not last forever without conservation.

**Protect Valuable Species.** Many coastal species need special protection. ICAM can preserve their breeding and feeding areas through protected reserves and the use of regulations.

**Conserve Critical Coastal Habitats.** Habitats of special importance to species and the functioning of coastal ecosystems -- mangroves, seagrass meadows, coral reefs, beaches, lagoons, and certain tideflats -- would be protected in ICAM programmes.

**Conserve Critical Ecological Processes.** Certain ecological processes are critical -- supply of nutrients, penetration of light through the water (avoid excessive silt and turbidity) and water circulation -- and need protection.

**Control Pollution.** Pollution from point sources and from land runoff as well as accidental coastal spills can create human health problems and ecological disruption.

**Provide Development Guidance.** Much of the ecological and scenic disruption of the coast is from inadvertent side effects of coastal development. An ICAM programme can provide advisory services to development entities to help them reduce impacts.

**Provide Planning Guidance.** To avoid damaging development initiatives to the coast, ICAM can provide advice to various planning entities -- physical planners, economic planners, development planners.

**Identify Critical Lands.** Certain areas of the coast have a special potential for recreation, housing, nature protection, economic development, and so forth. The ICAM programme can identify lands optimum for development and for nature.

**Restore Damaged Ecosystems.** Many otherwise productive coastal habitats have been damaged but are restorable. The ICAM programme can identify and restore such habitats.

**Public Awareness.** ICAM can help create public awareness of coastal values and needs for conservation.

- \* Some observers find this list deficient because it lacks explicit socio-economic goals (which are in fact embedded in paragraphs 1, 5, 7, and 8). Others find fault with the absence of any explicit reference to watersheds, an unfortunate omission as watersheds are undeniably linked naturally by water and sediments to coastal processes and coastal features like coral reefs.

Source: Adapted from: J. Clark, 1992, *INTEGRATED MANAGEMENT OF COASTAL ZONES*. FAO Fisheries Technical Paper 327. Food and Agriculture Organization of the United Nations, Rome.

At the outset of a new programme design effort, such as ICAM, strategic planning is the mirror image of what some persons call preliminary planning. It is the point where issues and opportunities arising out of resource use options and national economic development and societal needs are evaluated together with a view to eliminating incompatibilities. Of course, it is fundamental to programme design.

Box 5 presents a set of illustrative questions for shaping the strategic planning element within ICAM. These questions make it quite obvious that strategic planning is a recurring task. As circumstances change, the strategy needs to be responsive if it is to be effective.

**Box 5. QUESTIONS TO BE ADDRESSED IN STRATEGIC PLANNING**

- o Which coastal resources are seriously degraded; what are the economic consequences; what actions are needed to correct this situation?
- o What are the causes of the degradation; what type of developments and activities need to be controlled; what are the economic effects of the controls; in consideration of the variety of possible trade-offs and their effects, what actions are recommended?
- o Who are the principal users of coastal resources; how many jobs are at stake; how much income and foreign exchange earnings are involved? What further losses are expected if ICAM is not implemented?
- o What are the priority issues; what critical habitats and species need protection; what is the best approach -- regulation or protected areas?
- o What can an ICAM-type programme do to prevent loss of life and property from coastal natural hazards such as sea storms and beach erosion; what are the benefits of combining hazards protection and resource conservation in a single coastal programme?
- o What are the existing government programmes for coastal resources conservation at national and local levels; how effective are they; what are the shortfalls; what changes in governance are recommended?
- o How effective are the existing mechanisms for interagency and intersectorial coordination on coastal matters; what can be done to improve the situation; what actions are recommended?
- o What are the expected net benefits of a national ICAM-type approach, in economic and social terms; how can an ICAM programme be funded?
- o Who are the major proponents and opponents of the proposed ICAM programme?
- o What is the status of personnel training for ICAM; is there sufficient expertise; what can be done to improve the situation?

*Source: Clark, J., 1992. INTEGRATED MANAGEMENT OF COASTAL ZONES. FAO Fisheries Technical Paper 327. Food and Agriculture Organization of the United Nations, Rome.*

In a slightly different context, Chapter 17 of UNCED's Agenda 21 is very clear about the matter of strategic planning. Vallejo (1993), of the UN's Division of Ocean Affairs/Law of the Sea (DOA/LOS), has perceptively observed,

*... there is a need to formulate a long-term coastal strategy to provide an overall perspective on the role of the coastal areas in national development strategies. As such, this strategy would be the basis for decision-making in the medium and short term, and a framework within which emerging issues that arise over time -- via the international context, or via internal demands -- could be effectively addressed.*

### **4.1.5 Data Generation, Assessment, Interpretation, and Management \***

Vallejo (1993) also advises that a rich information base is indispensable to assist the planning and implementation effort. This information necessarily originates in many agencies having diverse responsibilities. For this task, there is a need to create an information system and effective mechanisms for the exchange of information between interested users and organizations, for both professional analysis and the preparation of studies and plans.

Data management needs to begin early in the programme planning process because (1) it takes a long time to build the information collection system to gather information from various sources; (2) it takes so long to bring data quality up to a level where managers can make decisions with reasonable confidence; and (3) it takes time and considerable specialized effort to translate raw data into useful information in a "language" and format that can be easily understood by political leaders and non-experts. The basic lack of data and knowledge can be a major obstacle in the development of effective ICAM plans.

Although effective management depends on an adequate understanding of the coastal system to be managed, too often the scarce funds available for research are spent answering esoteric questions not necessarily useful to those attempting to address more practical issues. The type, quality and priorities for acquiring the additional scientific and technical information needed to achieve ICAM plan objectives first need to be determined, and the quality, scope and relevance of existing information should be assessed before deciding whether additional information requiring research is needed.

Obtaining data specifically for impact assessments is particularly difficult in smaller developing countries where existing data bases may be incomplete, scattered or of

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\* This item requires a repeat process for cyclical upgrade, revision and feedback as it serves as an ongoing, periodic or continuous input to the activities in the ICAM process.

questionable validity, and often do not include basic topographic maps or current resource inventories. Maps and aerial photographs may be restricted by the requirements of military security, and the cost of acquiring both archival and new data can be prohibitive. A related concern is the set of opportunity costs that may be associated with delaying an ICAM programme in order to collect time series data. For example, it is usually not feasible or sensible, either socially or economically, to postpone the construction of a large beneficial project for several years in order to obtain reliable, annual data such as forecasts of coastal flooding, storm wave run-up, or sedimentation rates.

Almost all new, larger-country coastal planning efforts require some new data and information. Substantial amounts of data are required to operate the complex models that are used to describe or predict the functioning of coastal systems. Baseline models that describe both past and present functions of coastal systems are particularly data intensive (World Bank, 1993). Most contemporary modelling is too complex, too costly, and far too academic for routine application in the early stages of an ICAM programme in the Wider Caribbean Region. Conceptual process and non-quantitative models can, however, be useful planning tools and should not be dismissed out of hand.

#### ***4.1.6 Concept Paper \****

To facilitate the process of getting formal government approval of the coastal area programme-planning process and to have a selling document to use with the general public, a programme concept paper should be one of the first deliverables completed by the planning team through the ICAM steering committee. It could be completed almost anytime after the issue scoping process is finished, the preliminary programme goals have been set and the stakeholders have been more or less identified and heard from in a public forum of some kind.

The concept paper, in general, can be a simple document which lays out the need for the new programme (the problems to be addressed), spells out what it is intended to be accomplished, indicates how the programme will be developed and by whom, and shows how much time and money will be required. It should, furthermore, reveal that it has a fair grasp of the leading issues and has identified the key stakeholders (and by definition which ones need to be "cultivated" because of a difference of opinion). The concept paper should also present a kind of visionary "persuasion model" of how much coastal affairs might be improved by establishing a forward-looking consensus about the future in the form of a well-thought-out, democratically developed, scientifically defensible new resource management regime for coastal areas. For reinforcement, it most likely would include a list of

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\* This item requires a repeat process for cyclical upgrade, revision and feedback as it serves as an ongoing, periodic or continuous input to the activities in the ICAM process. See also Section 5.1.

prospective institutional partners bearing responsibility for a successful programme planning effort.

To a degree, the concept paper would be a little like a standard development bank's pre-feasibility study, but with a stronger community-service commitment *vis a vis* the "commons" and a more business-like partnership for management between private sector representation and government in the form of parastatals (like port authorities) or a permanent coastal commission.

At this stage, since the document would only be requesting approval to *develop* an ICAM plan, it would not be specific regarding the final design of the programme itself. Rather it would specify the approach to be undertaken in the development of such a plan. The detailed structure of the ICAM programme would be decided during the subsequent development of the plan itself (see discussion of Phase 3 in Chapter 4).

Ideally, preparation of the concept paper should be a collaborative effort among the government agencies (local and national) and key non-governmental institutions that will be participants in the ICAM development process and later in the ICAM programme itself. The best option for actually getting a succinct working draft that captures the "persuasion model" idea would be for this document to be prepared by the coastal programme planning team, supported by an *ad hoc* group of experts already involved or expected to be involved in the ICAM planning process. However, who does it is not as critical as how close the product captures the spirit of the process of inventing an exciting new co-management strategy for integrated planning and management of coastal and marine areas.

Coastal stakeholder groups should also be invited to review the concept paper at an early stage. It is important that all of the affected interests be identified early and be invited into the process from the very beginning of the work. A strategy for dealing with the media would be important.

The objective is to reassure government and the public that:

1. difficult subjects and issues will not be overlooked or sidestepped;
2. solutions will not be proposed until a proper review of the issue(s) is completed; and
3. approaches are sensitive to the perspectives of various vested interests and interested parties among stakeholders as well as among government officials and agencies.

The concept paper as far as possible should reassure the reader as follows:

- o It should give evidence of having the support of, or at least the acquiescence of, the main resource users. Strong political opposition by those who gain their living from marine resources (like fishermen) could stall an ICAM programme.
- o The coastal strategy should give evidence of having been shaped by a group of individuals representing all interests in coastal areas. Involvement of the cognizant national planning agency at this early stage in the planning process is vital.
- o It should be made clear that the coastal strategy can become the integrating mechanism to insure that coastal concerns are more fully understood by national planners and that available opportunities are exploited for the attainment of development goals. Otherwise, this could be detrimental to the effectiveness of both ICAM and the country's National Development Plan.
- o The relationship of ICAM to traditional physical planning (when applicable) should be clearly articulated.
- o The ICAM programme would be expedited and strengthened by broad consultation with the municipal and provincial governments most affected by the programme. Equally broad consultation with a variety of national government ministries would be standard practice.
- o The Exclusive Economic Zone (EEZ) would not be neglected as an undeveloped resource, nor will seabed mineral rights be ignored.
- o It would demonstrate an understanding of the interrelationships between coastal areas and other regions of the country in determining development strategies. For example, a national transport policy and related plans have an important bearing on ICAM because, among other reasons, of the vital role of ports in inter-odal transport schemes. Therefore, the definition of the coastal areas in terms of strategic planning would go much beyond the traditional geographic definition of coastal areas. This aspect of planning and management has not been fully developed up to now and should be an integral part of the coastal strategy (Vallejo, 1993).

### ***4.1.7 Programme Instruments and Deliverables***

- (1) The Coastal Resource Issues Review, the Stakeholders' Survey, and the Concept Paper would be folded into a *Strategic Plan* with goals and tentative objectives for use in Phase 2 start-up.
- (2) Programme Instruments, as follows, would be folded into an *Operational Plan* for conducting Phase 2:
  - a. Staffing plans (paid, volunteer, affiliate, seconded)
  - b. Cooperating institutional arrangements (principally by executing Memoranda of Understanding)
  - c. Boundary documentation (tentative)
  - d. Public awareness programme plan
  - e. Media plan
  - f. Information management and networking plan
  - g. Funding proposals
  - h. Logistic support plan
  - i. Work plans for Phase 2 Operational Plan
  - j. Evaluation plan
  - k. Research plan (technical and scientific system characterization): for Phase 2 Deliverable
  - l. Institutional inventory and assessment plan: for Phase 2 Deliverable.

### ***4.1.8 Considerations***

- (1) There is no schedule for completing Phase 1 or rule that says Phase 2 cannot begin until Phase 1 is 100 percent finished.
- (2) Phase 1 should flow into Phase 2 in a seamless and uninterrupted fashion.
- (3) Phase 1 could be completed in two to four months but could take as much as five or six months if serious community-based resource survey and assessment work is undertaken.
- (4) Depending on findings, time available, the dimensions of the planning area and the scope of the planned effort, the upper and lower task lines on Figure 5 -- management at the top and technical below -- could be blended into one operating line, but the outputs should be kept separate and identifiable as different deliverables.

## 4.2 Resource Characterization and Problem Definition: Phase 2

### 4.2.1 Overview

An ICAM action programme consists of objectives and activities aimed at reducing or preventing certain stresses in the coastal zone, usually forms of resource mis-use, pollution, or habitat destruction that threaten the ecological, economic or aesthetic health of the coastal ecosystem. The key question is how to pinpoint the problem. Phase 2 of ICAM -- Resource Characterization and Problem Definition -- provides for information gathering to determine which problems will be addressed under ICAM and what actions are needed. Two parallel investigations provide the necessary information (see Figure 6):

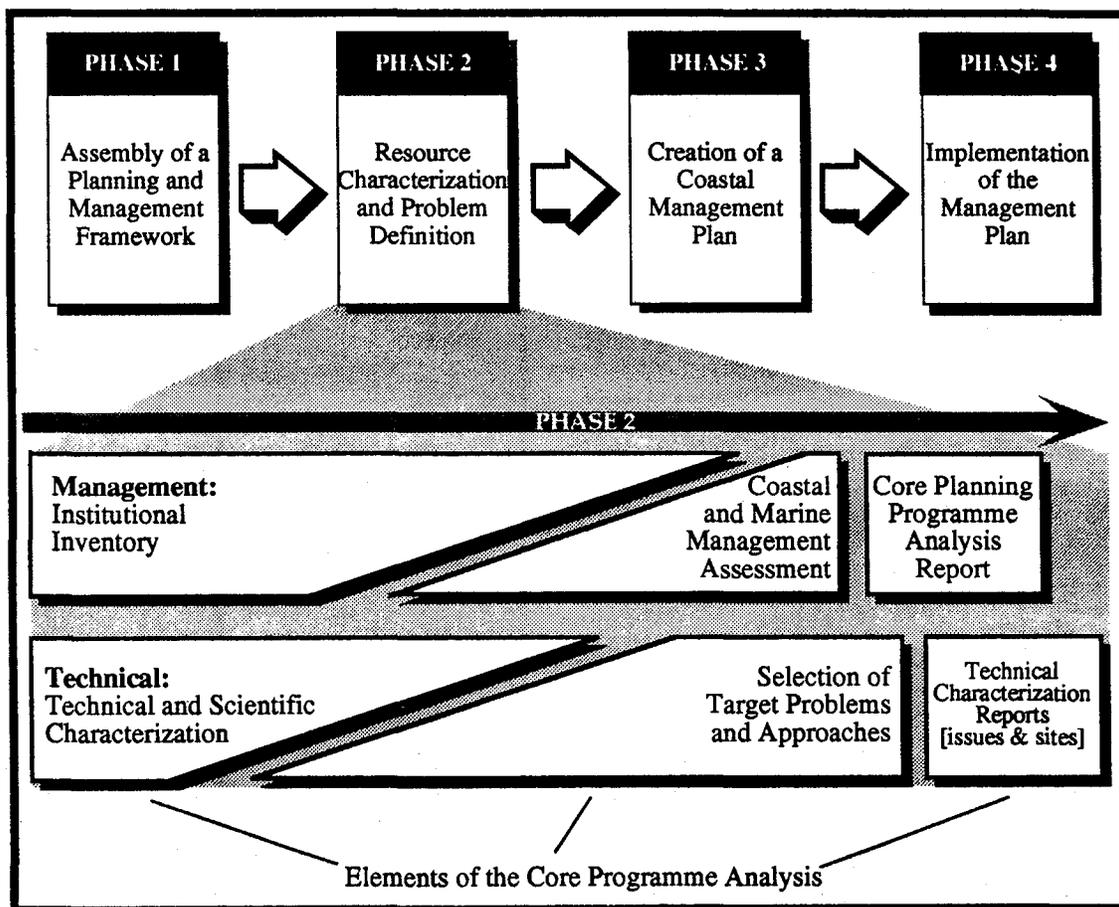


Figure 6. Elements of the Analysis Phase for An ICAM Programme: Phase 2.

*NB. Each phase presumes and requires regular dialogue with stakeholder groups and local community leaders.*

- (1) a technical and scientific characterization, and
- (2) a management characterization.

This second programme design phase of ICAM shifts focus from recruiting leadership and identifying expert counsel, institutional support, and information to developing the planning framework and carrying out a multi-stage design and planning project for ICAM. For example, Phase 1 sought institutional support from local and national organizations connected with marine and coastal activities for help in identifying issues and in preparing and reviewing draft work plans. This work is assumed to continue only until the programme planning component is completed and officially approved and the implementation phase is ready to go operational.

In this second phase, the emphasis is on a diagnostic assessment of the state of health of both:

- (1) the prospective "clients" (coastal ecosystems, habitats, wildlife and other "systems"); and
- (2) the prospective helping institutions (government and non-government) which might become part of the national ICAM programme team(s).

Additionally, Phase 1, by way of contrast, had no advance structure and therefore had -- as presented and as would be the case in real life -- an opportunistic quality about it. It is an architectural process, shaping a framework, and only becomes product focused as it reaches its concluding tasks.

This Phase 2, however, will be more product focused from the outset, with serious concerns for quality control, reporting standards, defensible science, reliable conclusions, technical accuracy, and the administrative detail of good documentation, meticulous record keeping, source tracking and up-to-date contact lists for use in ICAM public education and information dissemination.

### ***4.2.2 Technical and Scientific Characterization***

This task involves surveying the existing coastal ecosystem and taking its pulse (in its entirety with associated sub-systems) to determine the system's current and projected state of health and reasons for any decline. It also assesses the effectiveness of previous management and protection efforts and confirms the highest priority problems to be addressed by ICAM. To accomplish this, the task requires a marshalling of the necessary interdisciplinary expertise to develop an information base about the status and the dynamics of all coastal and marine ecosystem components -- key habitats, important sites and species, natural processes, and em-

phemera such as migratory wildlife, fish spawning and sea turtle nesting aggregation.

But this is not a research task. It is a data search, analysis, interpretation, synthesizing and assembling task to provide the basis for establishing programme priorities and future decisions about intervention measures, monitoring plans and research priorities. It is also a refinement process and one which provides supplemental background documentation for the priority coastal resource issues ranked in Phase 1 and carried forward for programme planning purposes in Phase 2 (draft) and in Phase 3 (final).

### **4.2.3 Targeted Information Needs**

Coastal ecosystem information requirements fall into three general categories:

- (1) *Impacts and Contributing Causes.* What is the exact nature and magnitude of each priority problem (e.g., what is happening to coastal and marine resources)? What are the sources of stress, i.e., the contributing causes (as a class of sources, activities, or events such as industrial wastewater discharge, or runoff of agricultural chemicals or destruction of shoreline habitats through development)?
- (2) *Existing or Planned Control Methods.* What are the mechanisms for influencing the various contributing causes (e.g., regulatory programmes)? How effectively has the institutional "control" framework functioned to date in addressing each of the major problems identified?
- (3) *Actions to Address the Major Problems.* Where are adjustments needed to improve the effectiveness of the institutional framework?

The information needed to answer the first set of questions -- regarding impacts, trends and contributing causes -- is provided by a process called *technical and scientific characterization* (see Figure 6). Data on coastal conditions and trends are gathered and examined to gauge the scope and intensity of threats to the ecosystem and to identify likely sources of the stresses creating problems. After this information on priority problems has been analyzed, the ICAM steering committee (or coastal commission) decides which problems warrant attention. These then become the target problems. They may include some or all of the initial priority problems from Phase 1, as well as others whose significance was discovered only during the *technical and scientific characterization* process.

#### **4.2.4 Management Characterization**

##### **(a) INSTITUTIONAL INVENTORY**

The second category of information needs -- i.e., the existing or planned control methods -- is addressed by a process called *management characterization*. This is a two-part process. The first step (*institutional inventory*) identifies the governmental agencies and other organizations that exert influence over potential sources of coastal and marine resource degradation. This *institutional inventory* catalogs the mandates of these organizations, their jurisdictions, their specific coastal-related programmes, and their levels of effort. These agencies and organizations are instruments for addressing the coastal target problems.

A second component under the *institutional inventory* addresses the need for information on the institutionalized human resource base. Inventories to provide this information should be customized to the specific country and its level of development, user densities and use patterns within the coastal environment. They should include standard demographic, economic, social, spatial and institutional parameters, with a profile of significant economic activity by class and spatial distribution, seasonality, and intensity.

##### **(b) MANAGEMENT ASSESSMENT**

In the second step of the *management characterization* process, the ICAM planning team conducts a coastal and marine *management assessment* to determine how effectively the institutional framework is operating to protect and restore the coastal environment. The coastal *management assessment* builds on the foundation of descriptive information in the *institutional inventory*, identifying key strengths, weaknesses, overlaps and gaps (including legislative lacunae and deficiencies) in the current institutional framework. This evaluation produces ideas on how institutional activities or authorities can be improved, accelerated, or re-focused to better support the emerging ICAM objectives.

Figure 6 shows the main components of the *resource characterization and problem definition phase* and how they are related to each other and to the creation of the ICAM plan in Phase 3.

The separate, but closely related, *institutional inventory* and *management assessment* are conducted in parallel with the *technical and scientific characterization* and the consensus designation of coastal area target problems. The institutional inventory could and should begin as soon as the planning team is sufficiently organized, starting at roughly the same time as the technical and scientific characterization. The coastal management assessment begins somewhat later, focusing on the target problems arising out of the previous priority issue identification effort under Phase 1.

Note: Prior to starting Phase 3 (the ICAM Plan), a review of priority issues from Phase 1, as modified by target problems developed in Phase 2, is needed, in order to shape a working set of draft programme objectives for input to the ICAM plan.

### **4.3 Programme Planning: Phase 3**

#### ***4.3.1 Elements of the Plan: Concept Formulation***

Basic elements to be added to the concept paper, the preparatory environmental inventory and institutional assessment work done under Phase 1 and Phase 2 (which generated a ranked agenda of coastal issues and problems awaiting attention or action) are the following:

- a monitoring and evaluation system
- an information/documentation system
- an applied research programme or strategy
- a public participation and educational plan and programme
- a unit of government formally committed to lead responsibility for administering the programme and for updating the core plan as needed (i.e., in charge of feedback flows from the evaluation and monitoring plan-based activities).

The countries already with coastal programmes also have documentation on the above which can have instructive value for those designing new programmes. Planners of new initiatives are counseled to aggressively seek examples of this documentation if only to get a clear picture of development alternatives before making commitments to a specific track or strategy.

For guidance in evaluating such existing "model" plans from elsewhere and in shaping a locally adapted conceptual framework for a new plan in a new location, it is useful to turn to existing published guidelines on the subject, such as World Bank, 1993; Awosika, *et al.*, 1993; Clark, 1992; Sorensen, *et al.*, 1984; and Cicin-Sain, 1993.

Since geography and unique regional geomorphological and other coastal features are significant determinant variables in any Caribbean coastal planning effort, it is recommended that a complete regime of coastal management planning documents be obtained by any planning team leader from at least one Caribbean country or territory with an existing or developing coastal zone or coastal area management programme. These include Barbados, Belize, British Virgin Islands, Colombia,

Cuba, Dominican Republic, Mexico, Puerto Rico, U.S. Virgin Islands, and Venezuela.

### ***4.3.2 The Plan Formulation Team***

The interdisciplinary group charged with formulating the plan will probably be an outgrowth of the same planning team first identified and organized during Phase 1. Its mandate, which should be clearly defined and recognized by ICAM participants, is to coordinate the expected input from cooperating agencies and institutions. The planning team should be based at an existing institution or agency, customarily the central planning office which has access to the paraphernalia of planning -- maps, cartographic capabilities, aerial photographs, land use information, and computers with existing data bases. Other units or offices -- even leased space from a large planning or engineering consulting firm -- would suffice, but a "planning" or "research" oriented physical setting or environment is important.

At this point in the process, the planning team could be expanded to include persons seconded from various government agencies having management roles regarding coastal resources. Key stakeholder groups should also be represented. Ideally, the team should be directed by someone representing a higher policy level in the central government (e.g., the national planning office, the national development office, the president's or prime minister's office). The team should also include at least key professional representation from the original core planning group or steering committee which handled Phase 1 and Phase 2. It should also have a resident staff marine scientist, a cartographer, and GIS specialist.

The plan formulation team should also have access to (and a budget for) a significant number of short-term specialists (legal, engineering, scientific, geological, oceanographic, economic). Ideally, the team should include one or more direct-hire professional "outsiders" (i.e., separate from those seconded from government) as integrative arbitrators to provide a resident conflict-resolution service to the planning task.

### ***4.3.3 Selecting An Agenda***

The planning team will need to develop (from a work plan draft prepared under Phase 2) the working agenda for this phase of activities with the following deliverables:

- o a formal Integrated Coastal Area Management Plan (requiring ultimate government approval);
- o supplemental management plans, for example,
  - information management plan

- public participation plan
- evaluation plan
- monitoring plan
- a pilot/demonstration project plan
- contingency plan (especially for hurricanes and oil spills).

This agenda is displayed graphically in Figure 7.

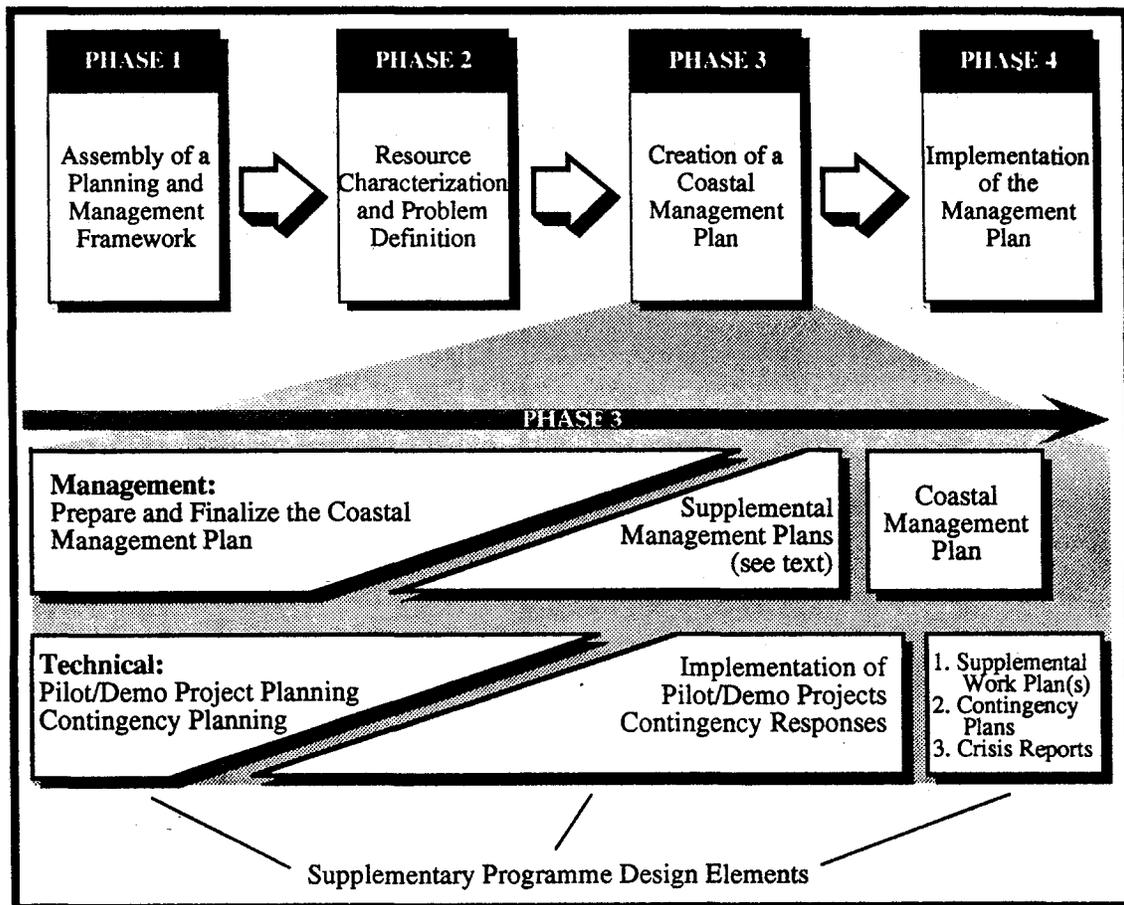


Figure 7. Elements of the Programme Planning Phase for ICAM: Phase 3.

*NB. Each phase presumes and requires regular dialogue with stakeholder groups and local community leaders.*

#### ***4.3.4 Planning Phase for Information Needs***

While significant data collection was completed under Phase 2, focusing especially on the coastal environmental system and the institutional fabric of the country relevant to coastal areas, a continuing data collection process, pertinent to the planning task, will be necessary at this point. It should include information on the categories which follow.

***Coastal resource base (any not completed under Phase 2 "Characterization"):***

- Present uses of coastal resources, including indications of point-source and non-point-source pollution
- Potential for present and future use.

***Socio-economic aspects of the coastal zone:***

- Existence and character of human settlements (villages, towns)
- Economic basis for human settlements and activity (including employment)
- Infrastructure (roads, airports, power systems, harbours, etc.)
- Existence of indigenous peoples and their traditional coastal activities
- Social issues.

***Existing environment and resource-related programmes (any not completed under Phase 2 "Management Assessment")***

***Institutional, legal and financial capacity:***

- Relevant national-level institutions
- Relevant regional/provincial-level institutions
- Relevant local institutions
- Survey of legal authorities relative to coastal and ocean activities
- Analysis of existing capacity-building efforts, including those funded by external sources
- Analysis of relevant extant legislation with recommendations for improving the legal framework in support of ICAM implementation and monitoring activities.

***International arrangements:***

- Treaties
- Regional and bilateral agreements
- UN programmes
- NGO programmes
- Other programmes of relevance.

During this phase, it is also important that ICAM planners consider the appropriate level of detail at which they need to conduct planning and programme manage-

ment. The issue of mapping scale -- since this will determine to a certain extent how detailed the information collection process should be -- is one that should be considered early in the ICAM process (see also Section 5.1.1).

#### **4.3.5 Geographic Information System Needs**

Access to a dedicated Geographic Information System (GIS) would be ideal, as would the availability of a full-time operator familiar with coastal system and coastal area mapping technologies (for more detail, see Section 5.1.6). If possible, an ICAM GIS should be functional *prior* to commencing the diagnostic tasks in Phase 2. This current task then becomes one of interfacing with the more science-focused earlier effort, in order to insure compatibility. The former system would acquire expanded capability (centralized or not) at the location housing the ICAM plan formulation team effort -- presumably in a national planning unit of government.

#### **4.3.6 Interagency Coordinating Mechanisms**

An early decision will be needed about the institutional locus or base for ICAM. A government-based coordination function and office is fundamental to the success of any ICAM initiative.

The primary purposes of the eventual ICAM programme coordination office, the provisions for which are needed in the coastal management plan, are:

- to promote and strengthen interagency and inter-sectorial collaboration;
- to reduce interagency rivalry and conflicts;
- to minimize duplication of functions in line agencies;
- to provide a forum for conflict resolution among sectors; and
- to monitor and evaluate the progress of ICAM projects and programmes.

The existing ICAM planning team might evolve as the institutional base for the eventual ICAM programme coordination office. This office could be established at any one of the following (in descending order of customary preference):

1. the national planning agency;
2. a newly established interagency or interministerial council;
3. a special coordinating commission or committee;
4. the formal designation (by the chief executive or legislative body) of one of the line agencies or ministries to act as "lead agency" to oversee an interagency coordination process;

5. a new parastatal similar to a port authority (i.e., a "coastal authority").

The ICAM programme coordination office generally oversees the implementation and operation of the ICAM programme and has general management and support responsibilities, particularly with respect to:

- coordination of national and local planning
- establishment of zonation schemes
- establishment of a permitting system (a project review/approval process)
- environmental impact assessments
- liaison with national, state and local units of government
- land use controls
- special area planning in the designated coastal area (usually the legislative body sets the boundaries).

While all aspects of the coordination function within an ICAM programme should be available for public scrutiny, it is of the utmost importance that any policy and goal-setting aspects of the coordinating body's activities be fully open and easily accessible to the affected coastal stakeholders and the interested public. Open public meetings that allow for detailed discussion and questions, supported by clear and understandable documentation, should be a part of the deliberations that lead to the selection of policies and goals, as well as deliberations (once the ICAM programme is operational) on development proposals and permits.

### ***4.3.7 Critical Elements For An ICAM Plan***

#### **(a) REGULATORY INSTRUMENTS AND MONITORING**

Regulatory instruments are most widely used in environmental management and in other fields of governmental activities where the market mechanism is absent or difficult to operate. They tend to reflect the "command and control" philosophy of management and until recently they were practically the sole instruments of environmental management. In addition to environmental regulations, they range from land use planning to building regulations, pollution control guidelines, standards for anti-fouling paints for boats, fishing quotas, marine transport regulations, aquaculture requirements and the licensing of various commercial activities.

When properly implemented, these instruments can help define the shape and nature of coastal development. Pollution regulations help to maintain environmental quality; other regulations define activities in a way to prevent pollution or aesthetic damage and to manage and conserve resources.

In most Wider Caribbean countries, the legislative framework for focussed and effective management of coastal resources is not in place or functioning inappropriately. There is a need for legal instruments (i.e., a coastal areas management act and supporting regulations), following existing examples of states in the region that have already developed these instruments.

Several concerns regarding regulations and control strategies are important to keep in mind:

- o As a part of the ICAM planning process, a review and analysis of extant legislation needs to be carried out, with recommendations made for improved efficiency and effectiveness in the management of coastal resources and coastal areas.
- o For every environmental objective, there is a choice of instruments, and their cost effectiveness should be the guiding principle. When other criteria are equal, the most environmentally favorable instrument should be chosen.
- o Regulatory instruments need an enforcement mechanism to put them into effect. For this purpose, managers should be able to make use of: (i) permits to build (e.g., hotels or marinas); (ii) withdrawal of permits to operate (e.g., of manufacturing facilities); (iii) imposition of effective fines; and (iv) access to courts for imposition of penalties, including those for damage to public health or the natural environment. As part of this enforcement process, monitoring of compliance is essential to assess the performance of the resource user, e.g., factories, hotels, fishing fleet, ship operators and so forth.

Monitoring systems to confirm performance under any regulatory regime for common property resources are essential and will be required as part of any ICAM programme. A separate monitoring strategy (that incorporates other monitoring activities) is suggested. An integrated monitoring approach, that coordinates ICAM monitoring activities with other government and non-government monitoring efforts, should be a long-range objective which is written into the ICAM plan.

Monitoring and evaluation procedures are the key to producing systematic flows of organized information as feed-back into the ICAM process for continuous revision and up-dating of goals and objectives in the light of actual performance. They enable the implementation results to influence goal formulation and policy adjustments, and thus effectively secure continuity and integration in the ICAM process.

**(b) DESIGNING INSTITUTIONAL ARRANGEMENTS**

Despite the recognition of their overwhelming importance, institutional arrangements for inter-sectorial and public-private sector linkages are too often poorly articulated, and are ineffective and inefficient. In addressing this problem, it is necessary to recognize that different contexts require different mechanisms and structures. The challenge is to design and implement institutional arrangements that are compatible with existing customs and traditions. These arrangements by nature will then strengthen control and environmental procedures and provide a legal framework for management (Awosika, *et al.*, 1993).

Experience also indicates that there is no "best" institutional arrangement for managing coastal resources. An institutional arrangement can best be judged by the effectiveness and efficiency with which coastal use conflicts are resolved. At this time, coastal resources and environments remain at risk from fragmented sectorial planning and development programmes.

The institutional coordinating mechanism was discussed in Section 4.3.6, and the decision related to this issue is viewed as critical to the programme planning team's strategy and plan formulation tasks. However, many government ministries and associated departments are likely to be involved in the development of an ICAM plan. Two networks need to be analyzed: the horizontal arrangement along the same government function, and the vertical arrangement within one sector. Horizontal integration describes efforts to coordinate separate sectorial divisions and thus to reduce fragmentation and duplication. Vertical integration indicates attempts to coordinate the separate functional divisions of a government sector, such as agriculture.

According to the experiences of governments that have completed the ICAM planning process, the extent to which the existing governance structure, laws, and management instruments provide an adequate basis for planning and implementation needs to be determined. A good regional example of this is the Barbados ICAM planning strategy, which placed great emphasis on analyzing needed changes in the existing system to make a coastal management system work to its best advantage at the least cost and with the least disruption from "new" institutions.

The reason for the need to adjust local laws, institutions and management instruments becomes patently obvious when one realizes that the problem of compatibility -- between the "new plan" and the "old" institutional and control system -- exists at two additional levels (regional and local), and goes well beyond the national-level coordinating function described in Section 4.4.2.

At the *intermediate, or sub-national, level*, more detailed but integrated planning and management are required. Such a process should ensure the consistency between the activities of local governments to reduce the danger of overloading the

coast. This should also cover areas outside local governments and those cases where conflicts with national authorities may occur, e.g., defense.

Detailed planning, development and implementation also take place at the *local level*. However, at this level distinction should be made between areas where one local government authority can effectively manage the coastal zone and those areas where several local governments need to cooperate closely to plan and implement policy. Especially in the larger Caribbean countries, to cover all land resources and coastal waters, all authorities involved in the operation, exploitation, conservation and maintenance of these resources should integrate their activities within a *local* coordinating mechanism, for example, a coastal area management committee for several villages, or for an estuarine area including a small city. Such local committees might be established on a voluntary or on a statutory basis. Supporting legal arrangements would be required to give authority to local managers and management committees.

#### **4.3.8 Operational Considerations For Planning**

##### **(a) PLANNING BOUNDARIES FOR THE COASTAL ZONE**

*Planning* boundaries for the coastal zone should be specified early in the planning stage. Initially, a relatively broad *planning zone* should be delineated. Subsequently, a narrower *management zone* should be delineated. It is important to recognize that ICAM programmes evolve through stages from initial planning to final management programme. The first set of boundaries are for the planning phase and do not imply that the entire coastal zone delineated for planning purposes will be included in the management programme that evolves. In fact, the zone of management that emerges will in most cases be narrower than the initial zone of planning for ICAM. A key function of the planning phase is to refine the boundaries and reduce the width of the designated coastal zone to the minimum needs for management purposes.

The ICAM zone defined *for planning* should also include the areas most threatened by sea storms, tsunamis and certain other natural hazards. Thus, to the extent possible, ICAM planning boundaries should be functional boundaries, encompassing natural ecosystems and natural forces. But at the same time they should reflect the administrative boundaries of towns and industrial centers, that is, where possible the boundaries should be modified to include an entire community (Clark, 1992).

In balancing this concern for administrative boundaries with the equally defensible concern for the operating boundaries of ecosystem- and natural-process integrity, some continuing uncertainty, if not ambiguity, appears inevitable. This will be a significant challenge for the ICAM implementation team (Phase 4).

**(b) MANAGEMENT BOUNDARIES FOR THE COASTAL ZONE**

Once the generic definition of things like "wetlands" and "beach" is set, and various dimensions for specific habitats, ecosystems and estuaries are mapped, the overlay of the so-called targets of concern in some assembled fashion (on a GIS) will confront the need for a merger with the political process *vis a vis* the issue of demarcating optimum management boundaries.

One of the key decisions in formulating an ICAM programme is the size of the area to be managed. Ideally, the management zone should include all of the coastal resources of interest and all of the activities that are capable of affecting the resources and waters of the coastal zone. Such an approach could give rise to a zone that extends inland to the upper reaches of the coastal watersheds and seaward to the limits of national jurisdiction -- generally, the limit of the territorial sea (12 nautical miles).

With regard to the inland limit of the management zone, many governments have found it more practical to use an existing administrative or political subdivision boundary rather than the watershed boundary. Such an approach may rely on other activities in the upper parts of coastal watersheds such as watershed management, erosion control or pesticide reduction programmes to safeguard the coastal zone against poor quality runoff.

Similarly, although important marine resources of economic interest to the coastal nation may exist within its 200-mile Exclusive Economic Zone (EEZ), nations typically find other devices to coordinate ocean resource activities (e.g., fishing, offshore oil and gas extraction) with coastal area management than by broadening the coastal management zone to the outer limits of the EEZ (World Bank, 1993).

**(c) CASE STUDIES, PILOT AND DEMONSTRATION PROJECTS**

All coastal planning efforts face the challenge of demonstrating that a multi-sectorial approach to resource management is both possible and useful. The most efficient way of doing this is to establish case studies as the least-cost "test". The appropriateness and relative potential of applying certain institutional arrangements (e.g., inter-sectorial coastal management committees or councils) and management strategies (e.g., impact assessments and statements, shoreline exclusion zones) could be undertaken at the local level as case studies.

A slightly more expensive but more reliable approach is to experiment with a small-scale, real-time pilot project. Pilot projects should be selected as early as possible in the ICAM planning process, so that the results will have maximum benefit. The project should not attempt to test every aspect of the proposed planning arrangements, but only those that are essential, the most innovative, and as yet untested.

Another means of testing new plans and technologies at the local level is through demonstration projects. Examples of demonstration projects include the planning, design and construction of an erosion control system, or a coastal park. Such projects also serve to show tangible results to the stakeholders of what a coastal management plan is capable of generating in the short term.

They are practical exercises in resource management, and can also be an effective means of building public support and a constituency for coastal zone management. This is particularly true if the demonstration project is directed at a critical area of concern, such as the flood proofing of a neighborhood destroyed by floods -- a subject extremely relevant to Caribbean countries like Jamaica, the Dominican Republic or Guyana. Demonstration projects, as with pilot projects, should be undertaken as early as possible so that the results will have maximum benefit for the ICAM plan.

The use of case studies, pilot projects, and demonstration projects is based on the experience that ICAM should be a process of incremental design and adaptive management. ICAM planning should proceed simultaneously as a collaborative experience between local communities and the national and/or regional government. Local activities need to be endorsed and supported by the highest levels of government; otherwise local successes may be perceived as threatening, and the process of extracting lessons for application elsewhere will be hampered.

There is a final dividend from pilot and demonstration projects and that is a combination of publicity, public awareness and participation which at another level "demonstrate" the promise of an integrated coastal area management strategy and its potential value for the immediate future to local coastal communities, investors, residents and resource users.

#### **(d) REVISION OF GOALS AND OBJECTIVES**

Finally, one overriding task of import for the ICAM plan formulation team, one best done in the early stages of outlining the plan itself, is to revisit the previously ranked issues and priority problems, to re-think the working list of programme objectives and to recast a series of operational objectives and integration objectives along the lines of those displayed as an example in Box 6. This should certainly be completed as a project task well before committing words to paper in the plan-drafting process.

**Box 6. WIDER CARIBBEAN ICAM OPERATIONAL PRINCIPLES**

Each Caribbean nation has an interest in shaping its own coastal area management system (or ICAM), one customized to the nature of its coastal areas, to its institutional and governmental arrangements, and to its traditions, culture and economic condition. Nonetheless, there are some currently accepted principles and characteristics associated with the concept which are useful to describe.

**Operational Objectives.** ICAM focuses on three operational objectives:

1. Strengthening sectorial management, for instance, through training, legislation, staffing.
2. Preserving and protecting the productivity and biological diversity of coastal ecosystems, mainly through prevention of habitat destruction, pollution and overexploitation.
3. Promoting rational development and sustainable utilization of coastal resources.

**Integration Objectives.**

1. Management of the coastal area as an integrated environment (natural systems and human systems) as an assemblage of linked ecosystems.
2. Management of participating government agencies, local and national institutions, and user groups in a coordinated fashion for integrated objectives.
3. Participation in the national planning process sufficient to achieve an integrated development management and monitoring strategy for coastal areas.
4. Application of an ecosystem sustainability approach to integrate sectorial and environmental needs in coastal areas.
5. Development of administrative mechanisms and conflict resolution methods for dealing with resource allocation and coastal site use.
6. Integration with "near shore", traditional physical planning.

**Assumptions.**

1. ICAM requires public awareness, active participation, and community-level training.
2. ICAM is evolutionary, dynamic, and interactive.
3. ICAM has established geographic limits (operationally speaking), but planning and ecosystem boundaries are more flexible, especially those hydrologically or aerodynamically linked.
4. ICAM seeks a balance between ecosystem protection and coast-dependent (and upland) economic activities.
5. ICAM promotes Environmental Impact Assessments (EIAs) that:
  - are integrated;
  - include institutional systems capacity assessment; and
  - include project monitoring of permit-performance conditions; end-of-project status, and ecosystem cumulative impact response (post project).
6. ICAM could be understood as an extension of traditional, "near shore" physical planning/land use planning, to include coastal and marine environmental concerns.

## 4.4 Plan Implementation: Phase 4

### 4.4.1 Implementation of the Management Plan

The final phase of developing an ICAM programme is presented in Figure 8. On one track, the focus is on putting into operation the salient components of the basic plan and its component and supplementary sub-plans. These include, among other components, an official map of the coastal area, zoning categories (if any), proposed "special areas", a monitoring plan, and an evaluation plan. These combine with previous and now continuing public participation, public education, training, and information management plans, all developed in previous phases.

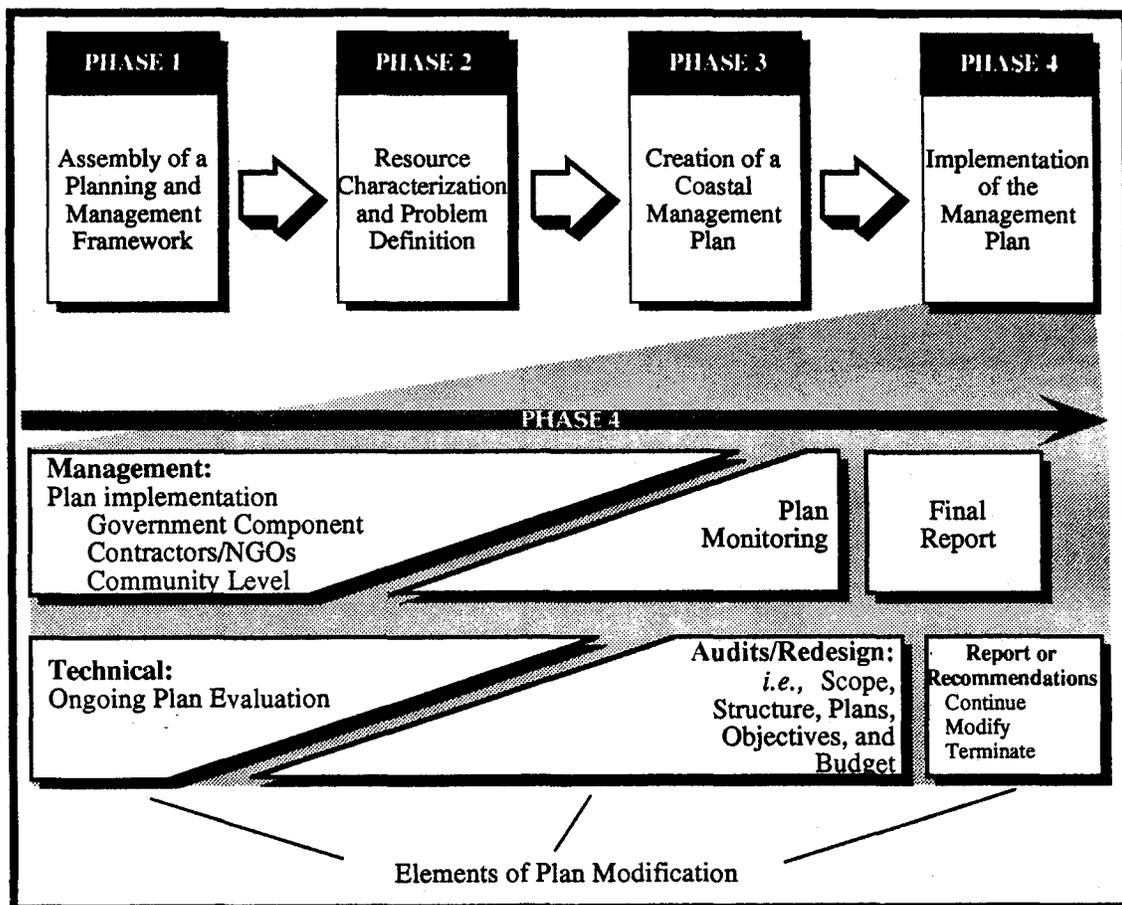


Figure 8. Elements of the Plan Implementation Phase for ICAM: Phase 4.

NB. Each phase presumes and requires regular dialogue with stakeholder groups and local community leaders.

Before action can be taken on the basic management plan, however, formal adoption by government is required for the following:

- o Adoption of the ICAM Plan and its policies, goals, new management measures and initial projects.
- o Establishment of the interagency coordinating mechanism.
- o Enactment, sometimes by legislation, of coastal zone management boundaries and zoning scheme.
- o Approval of staffing and organizational changes that may be required.
- o Approval of the funding allocation for the ICAM programme.

From the very outset, the interface of the ICAM programme with other regulatory and resource management activities, and with other governmental management units at the national and local level, will raise the issue of consistency. Improperly handled, it will generate controversy and place the new ICAM programme at risk of premature and hasty amendments to its programme plan. A procedure for addressing questions of inconsistency that arise during the implementation phase, especially at the local level, needs to be established.

There could be a quasi-formal testing period, given the time usually necessary to obtain the required executive and legislative approvals. Some parts of the ICAM programme may start to function earlier than others. Major legislative initiatives are not always required. In some countries, a decree or administrative rule is sufficient.

#### ***4.4.2 Administrative Elements of ICAM Implementation***

##### **(a) FINANCING**

Sources of government financing with which to commence implementation, and the requirements for lending/donor agency funds to implement and sustain the ICAM plan must be identified. To the extent that funding is assured through local revenue, the reliance on external sources may be reduced, although start-up funds for implementation may still be required. The expected cash flows from government subventions, external (lending/donor) sources, and revenue generation for ICAM must be established before practical implementation can proceed. Supplemental non-governmental funds should also be identified.

Possible sources of funding for ICAM include:

- grants from national governments at all levels with responsibility for ICAM;
- revenue from the approval of development applications;
- charges from the use of resources, such as water supply, sand extraction, tour operations, etc.;
- fines imposed for breaches of pollution, planning and other regulations and standards;
- taxes, such as head (visitor) taxes or direct (income) taxes;
- external (loan/donor) funds;
- lease payments for submerged lands rental and use of facilities.

**(b) WORK PLAN**

A work plan of implementation tasks, to be broken down in terms of ICAM tasks, the agency responsible, and the time of start-up (and, where appropriate, completion) is needed. Activities should be sequenced to provide appropriate boundary conditions for the achievement of subsequent steps.

Tracking and verification procedures on achievement or slippage in each area of activity are required to allow for timetable adjustments or for changes in approach to be introduced. The failure to introduce such procedures may result in negative effects throughout implementation, especially where the completion of one task depends on inputs from other areas.

**(c) TRAINING**

Training should be provided for at several levels. This includes:

- policy makers in the political directorate, government ministers and community leaders, to be educated to appreciate the purpose and importance of ICAM;
- senior management in ICAM-related agencies responsible for critical or secondary ICAM tasks, to establish the need for interagency communication and coordination;
- within the agency responsible for ICAM, to understand the functions of management and the importance of information exchange and communication;
- technical support staff, in skills for data collection and analysis, and to improve interactions with resource users in the field;

- marine police, park/reserve rangers, and other law enforcement officers, in the special requirements for interpretation and application of the regulations and standards for ICAM.

Raising the level of awareness of the general public and user groups through education is critical to the success of ICAM. There can be no appreciation of, or compliance with, an ICAM programme if citizens do not know it exists, or if they are unaware of its structure, potential benefits and infringements. User groups within the area are likely to vary widely, so that specially tailored approaches are needed to avoid feelings of alienation and irrelevance. Target audiences who should be sensitized to ICAM during implementation include:

- specific user groups such as fishermen, diving and tour operators, beach vendors, researchers;
- developers, architects, engineers and planners in both the private and public sectors;
- residents of specific geographical units impacted by the coastal zone;
- educators in the school system;
- special groups, such as community action groups, NGOs, women in development groups, media reporters, and cultural and/or linguistic minorities.

### **(d) EVALUATION**

A statutory requirement for the performance of the ICAM programme on some recurring schedule should be written into the enabling legislation. Changes in factors external to the project, such as revisions to economic, land use, physical planning or other policies at the national or regional level of government can influence the achievement of plan objectives. There should be provision for re-evaluation if these policy changes occur. Similarly, it is essential that ICAM programme managers use all available channels to maintain their own inputs to revisions of higher-level government policy.

#### ***4.4.3 Intersectorial Strategies for ICAM Implementation***

For ICAM implementation, the following intersectorial components should be considered:

- o *Pollution control.* The adoption of specific standards at the national or regional level will allow for consistent application. This will require close coordination with existing pollution control and regulatory agencies. Sources of pollution can be point or non-point, and sufficient regulatory authority must be vested at the local level to identify infringements. The standards for coastal waters

adopted in other regions demonstrate the potential for policy implementation on a larger scale.

- o *Land use planning.* The implementation of policy is easier if the government owns and controls coastal land. If it does not, it still may be necessary to acquire it. Specific measures that can allow for government control include restrictions on development, zoning, rights of access, natural habitat protection, limits on infrastructure development, and setbacks. This is often part of the development control process regarding private sector land use.
- o *Environmental assessment and audit.* The potential impacts of a development may need to be identified before planning approval in the coastal zone can be granted. Customarily there is one government agency in charge of serving as an impact assessment clearing house or permitting unit. ICAM liaison with this unit is critical.
- o *Conservation.* The creation of special management area status is a strategy that is increasingly used to limit the degradation of, or to preserve or enhance the coastal environment. Linkages by ICAM with national park management units and other custodial government activities for protected areas in the coastal zone can open up alternative management options for ICAM programme staff.
- o *Training and Education.* As mentioned elsewhere in this document, in the absence of appropriate and effective legislation and enforcement mechanisms, the employment of training, educational, and awareness building activities for resource users and the general public should be considered a critical component for successful implementation of the ICAM plan.

#### **4.4.4 Monitoring and Enforcement**

Monitoring may be defined as the "watchdog" of the ICAM process, aiming to establish the necessary flow of information on decisions, actions and investments as these relate to the implementation of ICAM. Evaluation utilizes the information generated by continuous monitoring and analyses of the effectiveness with which ICAM decisions have been carried out, the efficiency of the investments undertaken, the equity in the distribution of benefits among the various social groups of the community, and the impacts of ICAM actions on the environment.

Monitoring can take several forms:

- o *Ambient conditions.* Ongoing routine observations of environmental and socio-economic parameters (sometimes called "status and trends" monitoring) allow the changing conditions of the managed area to be updated.

- 
- o *Compliance or surveillance monitoring.* This establishes the extent of human activities in the managed area, and the infringements of regulations or standards that may occur.
  - o *Structure monitoring.* Where investments have been made in structural measures for coastal defense or shoreline stabilization, ongoing performance monitoring should be undertaken for programme elements.
  - o *Programme monitoring.* A reporting and evaluation system must be established to ensure that the objectives are being achieved within the implementation schedule.

Enforcement is a sensitive area that can have major negative effects on implementation if it is not conducted in a manner that assists the maintenance of rapport between programme managers and user groups. Several levels of enforcement are possible and perhaps should start with education and outreach before punitive or legal actions are taken. The integration of ICAM enforcement activities with other enforcement undertakings in the country -- for example, those undertaken by wildlife and park rangers or port authorities -- will require special attention and careful planning.

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## **CHAPTER 5.**

### **TOOLS AND TECHNIQUES FOR THE IMPLEMENTATION OF ICAM**

Coastal area management requires that decision makers and professionals employ a number of tools and techniques to aid in implementing a fully integrated ICAM programme. The application of some of these tools and techniques calls for highly skilled, specialized teams. Most of them, however, employ methodologies which can be essentially handled by the expertise already available in developing countries. This Chapter identifies several broad classes of tools and techniques available to ICAM decision makers and professionals:

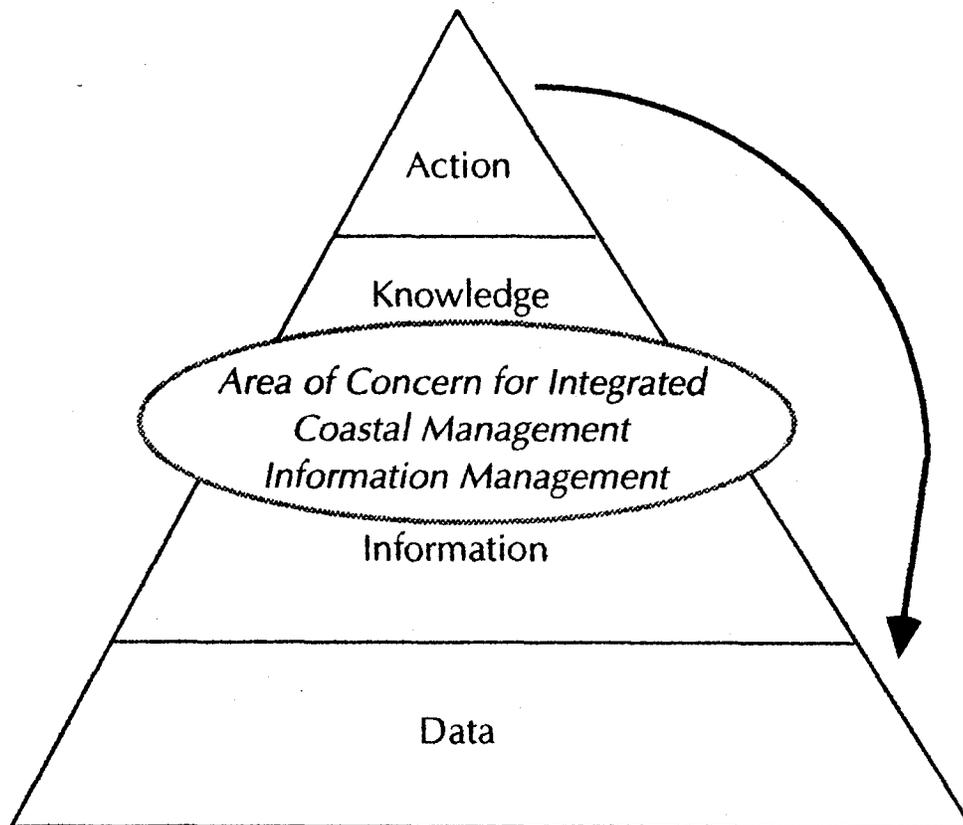
- information management,
- coastal marine parks and special area management,
- environmental impact assessment,
- economic evaluation,
- control instruments for implementation, and
- risk assessment and management.

#### **5.1 Information Management**

Integrated management of coastal and marine areas requires the assembly, management, analysis and dissemination to decision makers (and their technical advisors) of large amounts of information about four-dimensional target area environments, resources uses, pollution, and ambient conditions within given timeframes. There is a continual problem of finding convenient ways to combine old (historical) data and new (real time) data to shed light on what is happening in the way of status and trends within the resource base and related human use practices.

A problem facing coastal zone information management, especially when it is a new planning and management initiative, is that the true priorities and scope of coastal zone management activities are not known in advance -- the tendency is to build a data collection system beyond managers' needs or the ability of the organization to maintain over time. The biggest temptation is to collect and manage data, rather than information. Information is data that has been processed -- hopefully by others. The diagram on page 80 illustrates the issue.

Another temptation is to collect the most accessible data regardless of its usefulness or potential role in decision making within either planning or management functions. It is very important to have a plan for using the data and a justification



for its collection. It is also important to address *in advance* data compatibility with other information systems.

One of the less obvious implications of an integrated programme is that the activities of the programme depend on both the financial and information resources of other agencies and programmes with an interest in the target area. It is important to reinforce this concept in the design of coastal information systems, to ensure that the integrated coastal programme operates within and among (rather than being superimposed on top of) the institutional framework of the national and regional administrative and political systems. Therefore, except for those issues that are specific to coastal zone management, the programme needs to tap existing programmes and indicators of their impact for the bulk of its information resources. This also has important implications for data quality, discussed in Section 5.1.5 below.

Additionally, regional information needs define some of the information requirements for coastal area management at the national and local level. These regional

programmes include the support to comprehensive, integrated coastal and marine management activities provided by the UNEP Caribbean Environment Programme, IOCARIBE, CARICOM, UNDP, and other regional organizations. Demands from these external regional and even international level organizations and programmes seeking new data from emerging national programmes will tend to suffer also from data need inflation. This should be resisted by insisting upon negotiated *quid pro quos* of information useful to management.

The UNEP Caribbean Environment Programme is promoting an information systems and networking project, called CEPNET, for environmental policy makers, managers and planners in the Wider Caribbean Region. On one level, the CEP is building a regional information network, consisting of both informal communication links among professionals throughout the region, and a formal telecommunications system built around established networks, such as Bitnet or the Internet, or a stand-alone electronic bulletin board. This dimension of the CEPNET project will be a powerful research and information sharing tool for ICAM planners and managers throughout the Wider Caribbean Region.

ICAM programme managers should engage in a formal process of "requirements analysis" with technically competent information systems professionals. The CEPNET component of the Caribbean Environment Programme includes a technical analysis component which should be a useful resource for participating ICAM programme managers who should develop a similar schedule of work to shape the architecture of the local information system. The requirements analysis should involve the range of potential users, in a facilitated group process, such as a Joint Applications Development (JAD) session.

Integrated coastal areas managers need to carefully consider five elements of the information management process. These are:

- (1) scale,
- (2) indicators derived from other programmes,
- (3) unique coastal programme indicators,
- (4) regional data and information needs, and
- (5) data quality.

*As used in this discussion, programmes use "indicators" to measure environmental conditions or trends. They may be direct measures, surrogates, or subjective categories (e.g., best professional judgment). There is a vast literature of environmental indicator selection technologies for programmes that have the time to consider such issues.*

There are several commonsense rules which managers should consider in developing the internal information systems for any Caribbean coastal area management programme, regardless of type. It should be clearly understood, however, that significant programme strategy decisions underlie these information management issues. Before information systems can be planned or implemented policy makers and programme managers, at both the Wider Caribbean Regional and also at the national level, must define strategic directions and priorities for the programme.

### **5.1.1 Scale**

National programme managers need to consider *from the beginning* the appropriate level of detail at which they need to conduct their planning and programme management. This is a novel concept because we are not accustomed to thinking about the geographic scale of our decision-making processes. An example may be helpful:

A coastal area management programme inherited a series of digitized maps at a scale of 1:25,000. These maps were soon discarded, however, because the coastal area management programme needed to be able to reliably locate ground water sources (springs and wells) and surface water outlets on specific property holdings. In order to depict the small land holdings of this particular island, a map scale of 1:5,000 or 1:6,000 (i.e., 1" = 500') was necessary.

- The *management requirements* of the programme defined property holdings as the lowest common denominator for management attention;
- The size of local land holdings and conventional standards of map accuracy defined the optimum scale for the programmes information and mapping systems.

Scale is important because the *costs* of building and maintaining fine scale (1:5,000) information is much greater than coarser scales ( $\geq 50,000$ ). Until recently, the rule-of-thumb was that doubling the scale (e.g., from 1:50,000 to 1:25,000) of a map quadrupled the cost of building and maintaining the map. Modern technologies such as SPOT™ digital satellite images and digital orthophotography have decreased the relative costs of fine-scale coverage, but there are still major differences.

In general, integrated coastal area programmes need to be clear about whether they will manage the coastal areas on the basis of:

- o established political jurisdictions, such as island, parish, county, crown land, electoral district, estate or department,
- o convenient natural features, such as watersheds, wetlands, eco-regions, or estuary type; or
- o fine-scale features such as property holdings, or coarse-scale land use features such as urban zones, industrial zones, problems areas like high-risk coastlines, or tourism zones.

Political jurisdictions will often define the scale of a programme because these usually account for historic impacts and commonly understood resource allocation decision processes. Therefore, relevant historical data and current budget data will be most commonly available in these terms. Modern GIS systems can generally adjust for many differences in these historical patterns to provide information at a new scale -- as in the cases of an administratively divided watershed with erosion problems that threatens coastal water quality if the coastal area management programme decides it is important.

There is considerable flexibility in scale selection. The scale chosen for coastal programme planning and management does not prevent the programme from collecting data at finer or coarser scales, as needed for specific analytical tasks. Any fine-scale data can be generalized to a less precise scale. However, note that this is not a reversible process.

In Box 7, some of the problems associated with using high-precision locational information are pointed out.

**Box 7. LOCATIONAL ACCURACY**

Modern mapping tools, digital ortho-photography, Geographic Information Systems (GIS), and Global Positioning Systems (GPS) create the possibility of locating anything a person can touch to incredible precision. Even a single small GPS unit, available for less than US\$500, can produce latitude and longitude measurements to an accuracy of no less than  $\pm 100$  meters. ICAM programmes should resist the impulse to apply these technologies at the highest levels of precision for two different reasons:

- o tracking geographic data at high levels of precision creates long-term costs for the program -- to keep some detailed geographic databases up-to-date can cost 60% annually of the cost of creation;
- o high-precision locational information will distract attention from appropriate scales of information aggregation. Analysts, managers, and policy makers will be forced (or tempted) to address detailed local problems, when they should be looking at general trends and tendencies.

### **5.1.2 Indicators Derived from Other Programmes**

A variety of indicators from existing national and local programmes need to be incorporated in the ICAM information design. These include:

- o indicators of environmental condition collected by water monitoring, wildlife, parks, agriculture, forest, fisheries, and other agencies;
- o indicators of impacts on the environment, such as the numbers of boats in major anchorages, or the pounds of persistent pesticide applied per watershed;
- o indicators of government programme investment by programme and at the chosen level of geographic precision (*e.g.*, port investments on a county-by-county basis);
- o indicators of government programme performance by programme and at the chosen level of geographic precision (*e.g.*, best agricultural management practices adopted per farm by parish or watershed);
- o non-critical indicators or surrogate measures of environmental conditions, including key historical trend data (*e.g.*, volunteer counts of turtle nesting, marine bird surveys, map documentation of beach losses);
- o episodic events or phenomena which may be indicative of changing environmental conditions, such as the cessation of demersal fish spawning activity, reef bleaching, or epidemics of porpoise or sea urchin death;
- o economic indicators of wealth, earnings, employment, public revenues, pollution costs, resource withdrawals, management costs, and investment;
- o population and housing indicators;
- o other social indicators.

To repeat the point made above, governmental or private institutions need to provide these programme indicators based on *available* information. If, for example, the reef divers have never accurately tabulated fish counts by precise geographic position, then it is the job of the coastal area management programme to persuade the divers that it is important for the coastal environment, and the country-at-large, to collect or retabulate the fish count data on a more accurate basis. Similarly, if the local government does not separate port waste-handling from cargo-handling investments and from port access road projects, then the ICAM programme has to live with the inefficient combined economic indicator, until or unless the government changes its accounting systems. (Of course, the ICAM pro-

gramme might conduct a special study to demonstrate the environmental problems caused by lumping the two types of investment together, but it would not routinely fix the data from the government finance office or the port authority.)

The assembly and analysis of available data, and its conversion into information useful to coastal system planners is a major task. This undertaking may take five or six years, which explains why a clear information development strategy is necessary.

Two additional points need to be made about management of information for coastal and marine resource planners.

*First*, it is important to focus on indicators, which are analytically calculated products of the source data. The ICAM programme wants to keep track of only indicators, not source data.

*Second*, the ICAM programme needs to be creative in seeking public and private sources of relevant measures, including things such as privately maintained lists of real estate transactions to assess public perceptions of environmental quality and amenities, fuel sales to measure some elements of economic health, or fish hook sales to measure fishing efforts.

### ***5.1.3 Unique Coastal Programme Indicators***

Historic and derived information from other programmes will not be sufficient to characterize all the key coastal features that the integrated coastal area management programme needs to address. There will be unique values, characterized by specific environmental indicators, which will measure environmental conditions and tendencies across the entire coastal area, or in specific areas of concern. The collection and analysis of data to support these values is the most important exception to the dictum that the coastal area management programme should deal in information, rather than source data.

It is beyond the scope of this framework document to describe the entire process of environmental monitoring and assessment, including the development of indicators, but suffice it to state that an ICAM programme needs to select a specific environmental monitoring model and adhere to it as the long-term programme measurement system. *Environmental Indicators* by McKenzie, *et al.*, published by Elsevier in 1993, provides an overview of the indicator development process, which is an introduction to building a reliable environmental monitoring system for coastal area programme assessment.

One model of a comprehensive environmental monitoring and assessment approach is EMAP (Environmental Monitoring and Assessment Programme), a research and development activity of the US Environmental Protection Agency

(EPA). The estuarine resource group of EMAP, in conjunction with the National Oceanic and Atmospheric Administration (NOAA), has achieved significant success in designing and applying estuarine and coastal monitoring technologies which provide statistically reliable indicators of environmental conditions with known levels of confidence over extended geographic areas.

Within the Wider Caribbean, the network of Biosphere Reserves (see Table 3, Section 5.2) provides a variety of key environments and accessible trained managers and scientific investigators who may be prepared to test and adapt these unfamiliar environmental monitoring technologies to the specific conditions of the Wider Caribbean Region.

The selection of a programme monitoring strategy will determine if the integrated coastal area management programme needs to maintain any source monitoring data. It is preferable to piggyback new monitoring requirements on top of established collection activities, with the ICAM programme covering the extra costs of collection and analysis, but the field collection activity actually being carried out by an operating agency. Maintenance of a source data archive and background information about the quality of this data should be supervised or operated directly by the coastal area management programme.

#### ***5.1.4 Regional Information Needs***

The UNEP-Caribbean Environment Programme is in the process of identifying the principal information requirements of integrated marine and coastal area planning and management processes in the Wider Caribbean Region. From these plans the region's coastal planners will receive constructive guidance on the general directions and specific content of regional information needs. These regional specifications should provide a baseline for all of the programmes, and possibly cost-sharing mechanisms for the data each coastal state would supply to the regional plan.

Examples of elements of the regional information strategy might include:

- o agency authorities in the coastal zone;
- o mapping of the coasts to specified scales, with detailed mapping for areas of special concern;
- o endangered species;
- o protected areas;
- o coastal risks and hazards.

### **5.1.5 Data Quality**

*The Law of Coastal Data Quality: Data which are not used are perfect.*

This tongue-in-cheek description of data quality summarizes many of the issues facing coastal and marine resource managers as they attempt to build and use an information system for their programme. Until managers begin to apply data to real decisions, the weaknesses of data collection and information processing procedures are not clear. Many of the data which the programme will be using to develop its systems are data which have never before been fully proofed or quality controlled, even though they have been collected for many years by other agencies.

An implication of the law of coastal data quality is that only through the use of data will we begin to understand the limitations and problems of source data, and begin to improve data quality. Coastal programme managers should understand that the data they first look at is *only the start* in terms of quality and sufficiency. Data management needs to begin early in the programme planning process because (1) it takes a long time to build the information collection system to gather information from the various sources; and (2) it takes so long to bring data quality up to a level where managers can make decisions with reasonable confidence.

Furthermore, building and improving the quality of data and information systems is more a political process than a technical problem. The technical issues are usually relatively straight forward. The hard part is designing a working environment in which the coastal resource agency and the data generating agency can collaborate openly and freely to build a better data base. For most bureaucracies, it is threatening to learn that much of the information being collected (and often published) is of poor quality, irrelevant or redundant.

The coastal area management agency needs to build incentives and rewards for its cooperating agencies to improve data quality, and it should be generous in giving the source agencies credit for improved data quality. The data management process should be planned strategically, with shared understanding among all of the partners that virtually all data needs to be improved, and that data linked to key resource allocation decisions needs to be improved first.

### **5.1.6 Desktop Mapping and GIS Considerations**

A geographic information system (GIS) is a computerized system for storing, analyzing, retrieving and displaying information in a spatial (mappable) format. Because GIS combines the power of a computerized database with the capability to view and analyze the data in a geographic context, it is a powerful tool for coastal and marine planning and management.

The use of a GIS will be a key consideration for any coastal area management programme. This is an issue of considerable complexity, which can only be determined by a combination of resources and problems faced by each programme. For this framework, we offer only some brief thoughts about possible GIS management models. At base, *good mapping is essential* to planning for coastal and offshore areas, and to displaying the results of that planning process to broader constituencies. The question facing an ICAM programme is how to build that mapping and analysis capability without devoting an unreasonable amount of resources to mapping and GIS database maintenance.

Coastal planners and managers need a basic *desktop* mapping and analysis capability. *ArcView*, *MapInfo*, *Atlas GIS*, and *IDRISI* are four personal computer systems which provide this capability. *MapInfo* and *Atlas GIS* provide desktop mapping for both PC and Macintosh platforms.

GIS is, however, only a tool. A GIS will not automatically "solve" complicated management problems, nor will it produce results that are any more reliable than the data fed into it. A well-conceived and thoughtfully implemented GIS can serve as a platform for assembling and analyzing the information needed to make wise management decisions, as illustrated in Box 8 with examples of ways in which GIS can support coastal management.

Not all of the potential applications in Box 8 can be met by the desktop systems discussed above. The desktop systems need to be backed up by a serious GIS analysis and data management capability, probably using UNIX-based workstations. These systems should probably be based in the main governmental planning or mapping offices. This analytical support should provide the heavy-duty data processing required to convert the masses of source data to summary indicators which will be used by ICAM programme analysts on the desktop systems. This two-tiered, or client-server model, is similar to the approaches discussed throughout this section, in which the integrated coastal area management programme needs to work intimately with other institutions to achieve its information management goals.

Geographic information systems are not cheap. New users often are unaware that the rule-of-thumb for GIS is that *data acquisition* costs four times as much as hardware and software combined. *Data maintenance* is also more costly than planned in most systems (as much as 60% of data acquisition costs, annually).

The costs of a geographic information system may best be met by pooling the resources of various departments, agencies, and organizations interested in the system. Typically, cadastral agencies, utility departments, and planning offices are the first to realize "pay-backs" from a geographic information system, and therefore are more inclined to invest in the technology.

**Box 8. GIS COASTAL APPLICATIONS**

**Spatial Database Development**

A GIS allows geographic data traditionally recorded in rows and columns to be displayed on maps. This assists in visualizing natural resource data and assessing spatial data relationships.

**Resource Queries and Evaluations**

A GIS can rapidly summarize information about soil types, vegetative cover, and existing or anticipated land uses within a watershed or sub basin, provided these data are mapped in digital format. This allows natural resources and potential demands on these resources to be assessed, compared across space, and compared over time. For example, a GIS might be used to identify areas undergoing accelerated land use changes, and assist in the selection of sites for water quality monitoring.

**Hazards Identification**

Some of the earliest and most common uses of GIS have been to identify flooding hazards in riverine and coastal systems. A GIS can be used to identify areas particularly vulnerable to erosion or slope failure due to steep slopes, converging terrain, high rainfall, intensive land uses, low topography, and/or unstable soils or dune systems. Typically, this involves "overlaying" and (if necessary) "weighing" GIS layers representing each hazard factor. Hazardous areas identified in this manner might be classified as "off limits" to development, or otherwise earmarked for special protective measures.

**Programme Coordination**

Mapping systems are very effective in promoting coordination across government agencies and programmes.

**Watershed Modeling**

At a more sophisticated level, GIS can be interfaced with rainfall/runoff or pollution models to predict, in a "mappable" format, storm runoff and pollutant loads on land and out into the marine environment. Such models may require years of data and highly detailed information to be useful. However, by interfacing these models with GIS, the user's ability to view and interpret various "what-if" scenarios is greatly enhanced.

Securing skilled staff is a special problem with new technologies such as GIS. It is hoped that regional universities and extension programmes will be offering courses in both GIS practice and in the application of GIS concepts to natural resource management problems. Until these systems have been in place long enough to create a cadre of skilled practitioners, ICAM managers will have to seek training opportunities from the informal sector.

Three different avenues need to be pursued:

- (1) There are several computer-based training systems which should be considered. The most elaborate is the UNITAR-sponsored tutorials for the application of the raster-based *IDRISI* system. There are four extensive manuals available for the *IDRISI* system, include a special volume devoted to Coastal Zone analysis.
- (2) Short-term (e.g., one week) training programmes in the specific technologies being used can be effective for staff who are actively employed in using a GIS. Short-term training should not be used if the system is not up and running.
- (3) Annual user group meetings (from three days to a week in length) are presented for most of the established desktop and GIS systems. These sessions, and associated workshops, can be extremely productive learning experiences, especially for staff who have worked with a specific system for more than six months. Staff who attend these sessions should be prepped with a series of questions or problems to be addressed at the meetings.

## **5.2 Coastal Marine Parks and Special Area Management**

There are many different reasons why an ICAM strategy sometimes is focussed not on the entire coastal zone but on selected "special areas" for management. Regardless of the reason, it is a very popular approach and is sometimes even used in combination with a formal, more geographically extensive, country-wide approach to resource protection. One common example of this latter practice occurs when coastal parks and protected areas are treated as special areas for planning and management purposes within national ICAM programmes.

For many states with extensive or very complex shoreline areas, establishing a national integrated coastal area management programme appears both formidable and costly. Some see an advantage in a slower, more incremental approach, focusing on some set or group of "special areas" representing only a select segment of the larger coastal zone or coastline.

Sometimes, however, the compelling force for moving forward with the idea of an improved coastal management regime arises from a threat to or crisis with a specific location within a coastal area, for example, a flood-prone cluster of towns near an estuary or a stretch of low-lying, inhabited coastline that experiences repeated storm damage from waves and tides. These represent special land or coastal use management problems and can be classified as "critical areas of concern". Investing time and effort in planning for such areas now may reduce damage and losses in the longer run.

Reasons why the concept of special area management (and the antecedent planning) has proven to be a popular, almost a customizing tool of ICAM programmes are as follows:

1. *Urgency and timeliness* - a specific site requires immediate attention for public health, economic, or political reasons, particularly in a crisis mode.
2. *Instructional value* - a specific site is seen as a learning vehicle or test case for ICAM programme staff.
3. *Incremental value* - a specific site is seen as the first-stage assault on a more complex coastal problem.
4. *Education value* - a specific site is perceived as a training and education tool for ICAM's larger national strategy.
5. *Protection value* - a decision is made to conserve an endangered site for scenic, environmental or cultural reasons.
6. *Experimental value* - a specific site is perceived by ICAM staff as having a demonstration value for enhancing public perceptions about the efficacy and value of ICAM as public policy.
7. *Unique site value* - especially difficult or unique features of a site or a group of sites as a class are seen as needing the buffering or isolating effects of protected area status at some level (although the level may not necessarily be specified at the outset).
8. *Special problem* - a site is host to a unique or especially difficult planning problem warranting special research, analysis or control, for example, a toxic waste site.

There is a body of experience, literature, and learned wisdom about how to undertake each of the above as elements of a coastal area management programme. Some have been completed in many locations with integrated approaches. Others have been done in a more sectorial fashion. But, taken together as a body of test approaches to real issues in real time on real coastal landscapes, they are infinitely better than theory as a point of departure.

The topical areas addressed by special area management plans within the Caribbean are eclectic. For example:

- significant natural areas
- culturally important areas
- industrial areas
- hazard-prone areas
- economically valuable areas
- unique or scenic landscapes
- waterfront renewal areas
- damaged ecosystems
- ecotourism areas
- wetland areas
- estuarine areas
- co-managed areas
- proposed park and protected areas.

### ***5.2.1 Parks and Protected Areas As Integral ICAM Components***

Coastal and marine parks, reserves and other protected areas should form a complementary and integral part of ICAM programmes. Such areas are a necessary component of coastal resource stewardship. Some areas may be protected by easement, by tax incentives, or by zoning. While the primary ICAM programme utilizes the *regulatory powers* of government to achieve resource conservation by controlling private development and resolving potentially divisive conflicts among competing users, this accomplishes only a part of the job. Additional and more focused natural area conservation (the custodial approach) can be accomplished by exercising the *proprietary rights* (rights by virtue of ownership) of government through declaration of protected areas -- as resource reserves, natural areas, and/or national parks -- and by the establishment of standards for action in adjacent buffer zones.

Protected areas complement and make possible other objectives of ICAM by, for example, conserving nursery areas for fisheries production, enhancing tourism revenues and recreational benefits, preserving wilderness values, and promoting baseline scientific and management studies. At the same time, protected areas gain from the ICAM programme important protection from external impacts. Thus, ICAM and protected areas programmes can be mutually beneficial. Together they ensure the maintenance of a healthy resource base upon which to build sustainable development.

FAO's special guidelines for critical areas (see Clark, 1992, Section 8.2) are especially helpful to an ICAM planner as they provide in detail the criteria and proce-

dures for identifying, ranking and selecting different classes of protected areas in order to optimize both the biodiversity value of natural areas and their ICAM values as well. The draft guidelines\* prepared for the Protocol Concerning Specially Protected Areas and Wildlife (SPA) to the Cartagena Convention (*Common Guidelines and Criteria to the Wider Caribbean Region for the Identification, Selection, Establishment, and Management of Protected Areas of National Interest*) and IUCN's *Guidelines and Principles for Coastal Area Development* (Pernetta and Elder, 1993) are also important.

The current explosion of regional interest in coastal and marine parks is testimony to both the high priority given to protecting coastal and marine areas and also the need to do so. The current multi-site marine park development programme of the Caribbean Conservation Association, recent marine park funding by bilateral donors, and the SPA Regional Programme of CEP represent important intermediate steps in the direction of an integrated regional system of protected marine and coastal areas.

### **5.2.2 The Specially Protected Areas and Wildlife Programme (SPA) and ICAM: A Test of Complementarity**

Governments of the Wider Caribbean, with the assistance of UNEP, have developed an innovative approach for the protection of coastal and marine ecosystems (including watersheds) through the SPA (Specially Protected Areas and Wildlife) Protocol of the Cartagena Convention. The effectiveness of this new approach though will be demonstrated *inter alia* by the eventual establishment of a *Wider Caribbean Regional Network of Caribbean Coastal and Marine Parks and Protected Areas*.

The SPA Protocol calls for the creation of a regional network of protected areas in order to conserve, maintain and restore ecosystems, in particular, to maintain the ecological and biological processes essential to the functioning of Wider Caribbean ecosystems. The Parties agreed specifically to protect key ecosystem components, such as coral reefs, seagrasses and mangroves.

There are three Annexes to the SPA Protocol. Annexes I and II list the marine and coastal flora and fauna, respectively, requiring the most protection. They include endangered and threatened species, subspecies, and their populations. Annex I contains a total of 57 plant species. Annex II includes all species of sea turtles and all marine mammals in the region. Annex III comprises 40 species of plants and 30 species of animals that do not need total protection but require appropriate management measures. Several species that may be relatively common in certain areas were included on Annex III based in part on their role as essential

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\* To be approved in October 1995 by the Interim Technical Advisory Committee of SPA.

components of vulnerable ecosystems, i.e., in providing habitat and in protecting biodiversity.

Specific objectives of the SPAW Protocol related to ICAM include:

- (1) *To establish a network of protected areas in the Wider Caribbean and a system of integrated coastal marine planning.* Management of a regional marine park system in the Wider Caribbean will provide for the monitoring, protection, restoration and ecologically sound use of the large marine ecosystem.
- (2) *To monitor human impacts on the health of coastal marine ecosystems.* Decision-makers will be provided with an improved basis for designing measures that effectively control environmental degradation.
- (3) *To develop Caribbean-based management expertise and public education campaigns.* The technical capability and management expertise of local personnel will be improved and public participation will be encouraged to provide the skilled manpower for nationally organized, regionally coordinated marine ecosystem management.

The fluid nature of coastal/marine ecosystems and the wide-ranging nature of marine species during various life-cycle stages make it imperative that these ecosystems be regionally managed and monitored in order to: (i) maintain the integrity of coastal ecosystems in the region; (ii) ensure the propagation of ecologically important and commercially harvestable marine and estuarine species; (iii) restore ecosystems and populations of depleted and endangered species; and, (iv) further develop the region's ecotourism industry. The last item points to the fact that there is a clear economic benefit to maintaining a healthy, systematically managed regional system of parks and protected areas. For example, gross revenue generated by the Bonaire Marine Park was estimated at about US\$25 million in 1991.

A SPAW Regional Coordinator will provide overall coordination to the system and should work jointly with ICAM leadership in each SPAW country in order to ensure ecosystem-wide ecological integrity. ICAM professionals would, in turn, assist the SPAW programme in developing a model regulatory framework to be used by participating states and territories when establishing parks in coastal and marine areas, and in shaping legal mechanisms and economic incentives to ensure compliance with national and regional standards and guidelines.

UNEP, with IOC and IOCARIBE, should develop and institute an improved monitoring programme for coral reef, mangrove and seagrass ecosystems protected within the proposed Wider Caribbean Coastal and Marine Parks and Protected Areas Network. A monitoring programme is essential for managing coastal and marine reserve and fisheries replenishment areas and for safeguarding those areas designated for ecotourism support.

### **5.2.3 *The Ecosystem Challenge to ICAM***

One of the reasons ICAM works, wholly apart from its integrated approach, is its capacity to zero in with an interdisciplinary approach on a specific coastal location in a problem-solving, conflict-resolving mode, while wielding policy tools like permits, pollution loads, zoning and fee schedules to influence user practices and maintain balance. However, this strength is also a constraint when it comes to devising new ways to manage ecosystems and maintain ecosystem integrity, which require not just consensus and balance but, in many cases, a reversal of the disturbing current process of ecosystem degradation.

There are some new lessons to be learned about the process of ecosystem restoration. The issues threatening coastal ecosystems must sooner or later drive ICAM's agenda, and policy, planning, budgeting and information systems must follow in train. ICAM's longer-range future in the Caribbean will depend on its capacity to be responsive to this new ecosystem challenge -- in order to meet the larger challenge of sustainability.

The UNESCO network of ecosystem management study sites in the region (the Biosphere Reserves listed in Table 3), as well as the SPAW Regional Programme, will provide some improved guidelines on ecosystem management and recovery. ICAM will benefit from these findings as will the region.

### **5.2.4 *National Strategies for Coastal Marine Ecosystem Management***

Past efforts to protect the marine and coastal environment and to manage specific natural resources have been fragmented, often working at cross purposes. Policies and programmes of many Caribbean governments, as well as private sector organizations, continue to degrade ecosystems and component natural resources, despite a variety of new environmental management initiatives at all levels of government. Integrated coastal area management, while promising, is no panacea! National strategies which include integrated coastal area management programming are quite likely to succeed more quickly than any single project.

Initiatives would be based on the following assumptions:

- o Coordinated approaches to ecosystem management are necessary for both regional agencies and national governments.
- o The environmental impact assessment process encourages a broad examination of environmental impacts not necessarily addressed by sector-specific legislation. This integrated assessment approach is particularly well suited to support ecosystem management.

Table 3. Coastal Area BIOSPHERE RESERVES\* in the Wider Caribbean Region.

LOCATION	NAME OF BIOSPHERE RESERVE	SIZE (acres)	DATE ESTABLISHED
Colombia	Sierra Nevada de Santa Marta	731,250	1979
Cuba	Cuchillas de Toa	127,500	1987
Cuba	Peninsula de Guanahacabibes	101,500	1987
Cuba	Baconao	84,600	1987
France (Guadeloupe)	Guadeloupe Archipelago		
Honduras	Rio Platano Biosphere Reserve	500,000	1980
Mexico	Reserva de la Biosfera de Sian Ka'an	528,147	1986
U.S. (Florida)	Everglades National Park	585,867	1976
U.S. (Puerto Rico)	Guanica Commonwealth Forest Reserve	4,006	1981
U.S. (Texas)	Big Thicket National Reserve	34,217	1981
U.S. (Virgin Islands)	V. I. National Park & Biosphere Reserve	6,127	1976

\* Established nationally under UNESCO's Man and the Biosphere Programme, these biosphere reserves represent superior instructional models of coastal ecosystems in use. They combine core area protection zones with adjacent buffer zones of community cooperation involving innovative, often experimental environmental controls and resource management approaches to research, monitoring, conflict resolution, education, and co-management. See also: Price, A.R.G. and S.L. Humphrey, eds., 1993. *Application of the Biosphere Reserve Concept to Coastal Marine Areas: Papers presented at the UNESCO/IUCN San Francisco Workshop of 14-20 August 1989*. A Marine Conservation and Development Report of IUCN, Gland, Switzerland.

- o Improved marine and coastal resources inventories, assessments and mapping are required.
- o Expanded research and monitoring on large marine ecosystems are also necessary.

### 5.3 Impact Assessment

Environment assessment (EA) (and, as it is also known, Environmental Impact Assessment or EIA), is a twenty-year-old methodology widely accepted and used in the developed world and by northern institutions as a tool for environmental management.

Adopted first in the United States under the then new U.S. National Environmental Policy Act (NEPA) of 1970, it was the first attempt to codify and formalize the nature of interdisciplinary project review from an environmental and developmental perspective (Figure 9). Since then, the practice has grown enormously, gained

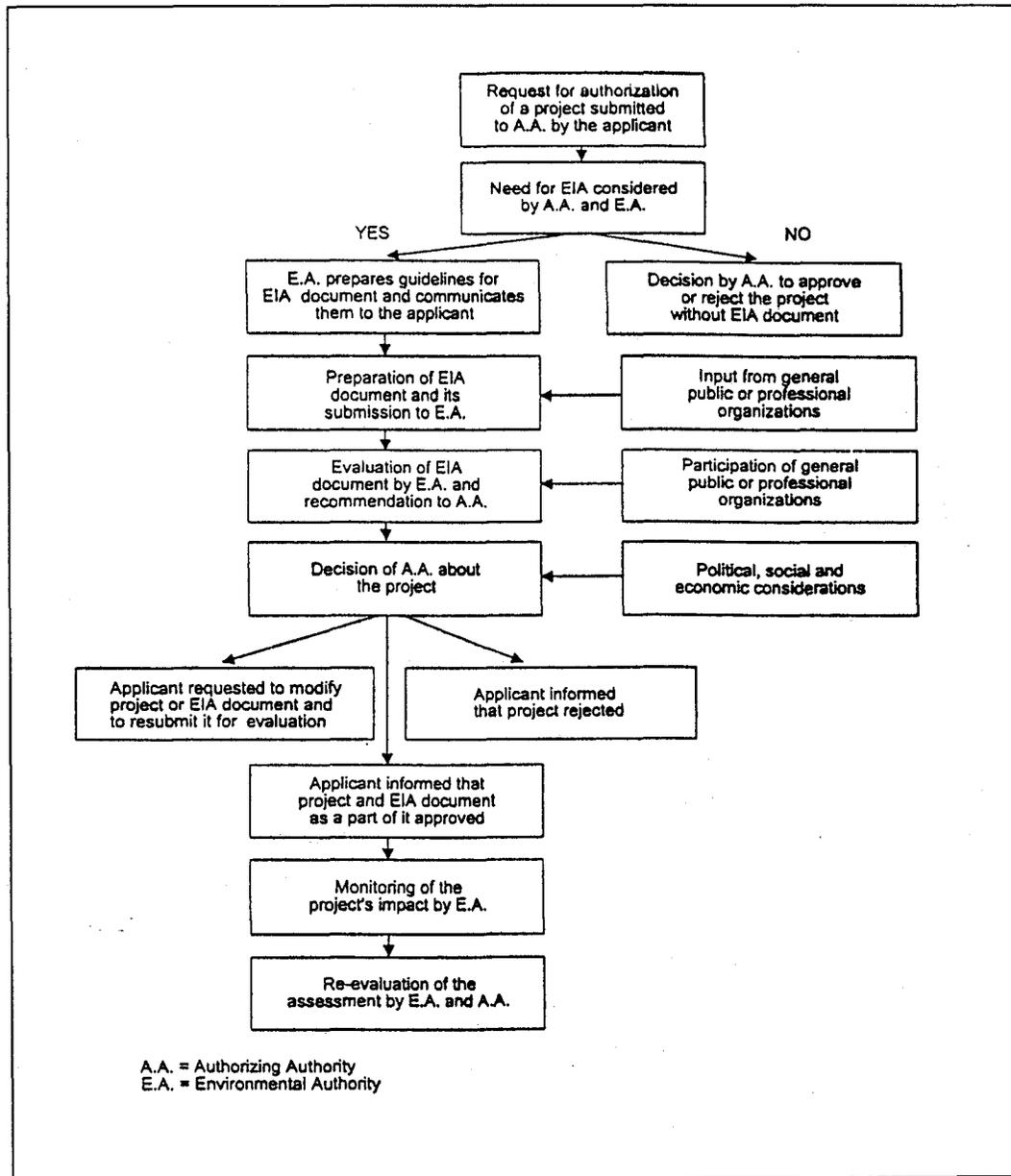


Figure 9. Simplified Flow Chart for the EIA Procedure (source: UNEP, 1990. *An Approach to Environmental Impact Assessment for Projects Affecting the Coastal and Marine Environment*).

international acceptance (by the European Community, for example), and is used by all multilateral assistance agencies and banks active in the Caribbean and by most bilateral donors in the region as well.

EA is not as yet standard operating procedure for many of the countries in the Wider Caribbean, despite the fact that as early as 1987 the International Association for Impact Assessment held its annual meeting in Barbados with a flurry of publicity and wide regional participation at the time. The theme of the meeting was "Impact Assessment and Development Planning". Several papers dealt with coastal and marine issues.

Unfortunately, EAs and EIAs have not lived up to their full potential. They are criticized as being environmentally biased and anti-development, costly, unwieldy for planning purposes, unreadable by the public and often also by the governments, and the cause of excessive project delays. Where do the faults lie? Do problems arise from the process (its structure and approach), or do problems arise from the practitioners and their inability to use the tool properly?

The problems with EAs and EIAs fall into five categories.

1. Unsatisfactory professional and technical training and professional certification of those using the tool.
2. The absence of a proper institutional vehicle or structure as a host or parent body within government (often it is an add-on assignment to an existing unit which can result in conflicts of interest).
3. Failure to factor socio-economic impacts into the findings, into the alternative scenarios and into the decision-making process.
4. Short time frames which presents difficulty in establishing cumulative environmental effects. This also limits the role of the EA process in helping development planners evaluate project performance and test the efficacy of previous EA predictions regarding "project effects".
5. A lack of political will to integrate the EA into the development process.
6. The late introduction of the EA in the decision-making process -- too often the project go-ahead is given before the EA is even started.

The provision of proper training is of paramount importance to the successful implementation of the EA process. Both the quantity and quality (i.e., appropriateness) of any training should be of concern. Quite possibly an "internship" or attachment training may be necessary to upgrade and test the experiential side of training. Team participation in truly multidisciplinary and integrated environmental and development planning work is of paramount importance.

What is required is a system of post-qualification applied training (attachment training in the field for example) and certification and registration of EA/EIA practitioners.

Recent European Community proposals to use EAs at all levels within the development process -- policy, programme and project -- are a step in the right direction. This idea, assuming it is also tested in the Caribbean area, would greatly facilitate an ICAM/EA marriage of convenience as overall environmental policy objectives -- for internodal ferry transport planning in a port, for example -- impact long before reaching the "project" stage for the siting of an actual ferry boat terminal along the crowded waterfront.

This approach is known as "strategic environmental assessment". It provides the perfect methodological interface with ICAM, and should be seen as an important ICAM planning tool. Both are integrative and strategic in outlook with a dependency on good information, public participation and accurate projections.

But it is not a perfect fit, and there are some problems. For example, the focus of impact assessment is on a site and the proposed project. ICAM is multi-spatial (coast, town, city, region). Impact assessment is a concentrated, discreet and intense process. ICAM is continuous. Impact assessment is a defensive maneuver, concerned with anticipating the consequences of an action (with short-term remedies). ICAM is proactive, concerned with moving toward an optimal set of conditions (with longer-term to indefinite conclusions).

How could two conceptually disparate "institutions" work together? Is there any common ground except the ground itself -- that is, the segment of the landscape destined for change?

The obvious commonality is, of course, their transparent openness and holistically integrative approach. Secondly, they complement each other strategically in that impact assessment comes into play as both a planning and management tool for ICAM in the implementation process. Conversely, impact assessment links the synoptic view of ICAM with the sectorial perspectives of the project and site.

The result is the marriage of strategic planning (ICAM) and strategic impact assessment in a truly symbiotic relationship, wherein each requires the other to perform and inform, and in a repetition or continuum of the implementation cycle.

## **5.4 Economic Evaluation of Environmental Impacts**

There is no satisfactory method to provide an economic definition (or value) for environmental effects. Economic effects can be identified at several different levels of complexity, ranging from cash flows to life-cycle costs, national environ-

mental accounts, and contingent values of environmental actions. During the early 1980s, many US and international environmental groups devoted considerable resources to several different ways of developing national environmental accounts, or contingency values for the environment. Notwithstanding the great energies which have been invested in the analysis of environmental values, and the rapid changes which have occurred in the past ten years, it is still true that there is no satisfactory way to provide an economic accounting for environmental costs or benefits.

Inevitably, attempts to assign economic costs to environmental changes founder on several fundamental issues:

- o The inexorable *power of compound interest*. As long as it is assumed that an economic benefit will grow at some positive compound rate, almost any cost assigned to environmental damage can be paid for by virtue of the compound growth of benefits. Similarly, any combination of environmental benefits can be made more attractive if the right combination of discount rates are used.
- o Our ignorance of the true *complexity* of ecosystems and especially synergistic effects resulting from disturbances to these systems. Chaos theory and complexity concepts are the latest chimera which hold the possibility of quantifying ecological interactions. There are two problems with these approaches: (1) no one is close to an answer; and (2) even if the equations could be defined and applied perfectly, they are likely to be only one element in the political, bureaucratic, and market processes which directly determine rewards and penalties in public policy making and management of coastal and marine environments.
- o The difficulty in *valuing intangible* environmental issues. If people appreciate brightly colored sunsets, should some element of air pollution receive a positive economic value because it creates more colored sunsets?

Figure 10 illustrates in a conceptual way the relationship of various cost or economic valuation systems. The diagram shows that moving outward creates a larger cost definition which subsumes the previous definition of costs and adds additional information. It should also convey the idea that the boundaries of cost elements at the higher (outer) levels are less distinct.

### **5.5 Control Instruments for ICAM Implementation Processes**

For each of the *strategic issues* identified for the integrated coastal area management programme, there should be a series of *problems*. For each of the problems, an *institutional inventory* (see Section 4.2.4) should identify the *control*

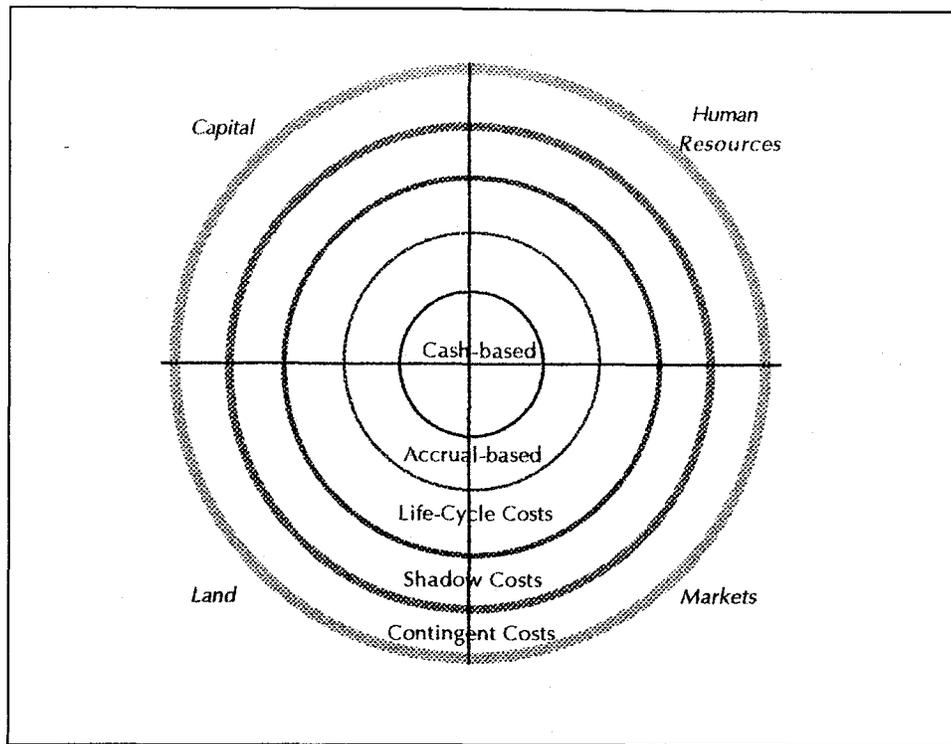


Figure 10. Conceptual illustration of the relationship of various cost or economic valuation systems.

*instruments* currently being employed (by which institution) to manage the specific problem. This sub-section identifies Control Instruments actually used, but these same instruments need to be assessed for their appropriate use as tools for future implementation strategies. There are a several styles or means by which a programme can employ these instruments. Exactly how they will be employed is a function of national culture and current institutional capacities. The most successful programmes will use multiple approaches, carefully coordinated and focused; the least successful programmes may have all of the same programme features on paper and will implement them all ineptly.

For example, land-based sources of pollution are likely to be a strategic issue for most marine and coastal programmes. A problem contributing to land-based sources of pollution is agricultural run-off. Table 4 illustrates how this problem might be assessed following the Institutional Inventory. The entries in italics represent the priority initiatives which the programme might identify for future action.

(This matrix is institutionally based; in section 5.5.3, an approach based on the selection of policy instruments is presented. Planners need to consider both approaches.)

Table 4. Sample Matrix Linking A Strategic ICAM Issue to Identified Problems and Recommended Control Instruments.

Issue: Land-Based Sources of Pollution				
Control Instruments:	Priority Problems:			
	First: Agricultural Run-Off	2nd: Publically Owned Sewage Treatment	Third: Private Sewage Discharge	etc.
1. Voluntary Reduction	Ag Extension Service			
2. Standard Setting and Enforcement		Ministry of Public Health		
3. Permit Issuance and Enforcement	<i>(pesticides only)</i> Banana Coop MinAg <i>extend to other crops</i>		<i>Ministry of Public Health—requires new law</i>	
4. Direct Financing		IDB Loan to Central Bank Accelerate Loans		
5. Economic Incentives				
6. Education and Information	Radio Nacional			
7. Technical Assistance	Win Ban New Ag Extension	PAHO Fellowships Operator Training		
8. Land Use Restrictions				
9. Remediation				
10. Emergency Response		Min of Public Works		

**Bold=existing instrument**  
*Italics=proposed for Coastal Zone initiative*

Ten major control instruments for institutional assessment and programme implementation are listed as follow:

1. *Voluntary Pollutant Reductions by Source (Cleaner Technology)*
2. *Standard Setting and Enforcement*
3. *Permit Issuance and Enforcement*
4. *Direct Financing*
5. *Other Economic Incentives*
6. *Education and Information*
7. *Technical Assistance*
8. *Land Use Restrictions*
9. *Remediation*
10. *Emergency Response*

An alternative characterization of these tactics might address the nature of the implementation instruments, such as

- o Regulatory Instruments, and
- o Economic Instruments.

The following discussion is adapted from the OECD (Organization for European Cooperation and Development) handbook on *Coastal Zone Management: Integrated Policies* (Cedex, Paris, 1993).

The range of instruments available for implementing environmental aspects of development projects can be broadly classified as regulatory or economic. A third category of instruments, often used in conjunction with regulatory or economic ones, is that of internalizing environmental awareness and responsibility into individual decision-making by pressure or persuasion either indirectly or directly (e.g., in negotiations for voluntary agreements or covenants between industry and government on environmental issues). This is not an economic instrument as such but does have a characteristic in common with economic instruments: it may be a very flexible one.

### **5.5.1 Regulatory Instruments**

Commonly referred to as a "command and control philosophy", regulatory instruments can be characterized as "institutional measures (on the basis of some form of legislation) aimed at directly influencing the environmental performance of polluters by regulating processes or products used, by abandoning or limiting the discharge of certain pollutants, or by restricting activities to certain limited times,

etc., through licensing, setting of standards, zoning, etc. Their main feature is that non-compliance results in penalties in judicial and administrative procedures.

Advantages attributed to use of direct regulations are the *grip* authorities have on the behavior of actors; there is considerable experience by authorities in their operation and the rules are clear to all parties, which provides a sense of certainty.

A number of disadvantages have been identified, however. Direct regulations are increasingly felt to be static, inflexible and sub-optimal in terms of environmental and economic efficiency. For example, in some instances, once a license is issued, a polluter is not encouraged to react flexibly to changed economic or technological conditions. This highlights the need for regulations and policies to focus on both initial compliance and continuing compliance.

Bargaining and negotiation processes that supplement direct regulation may offer a new direction, based on mediation and arbitration experiences in the late 1980s. The advantages of this approach are suggested as two-fold:

- o There is a higher likelihood of compliance than in the situation of regulation without negotiation;
- o It introduces flexibility to adapt to new or changed circumstances (economic, technological, social).

### ***5.5.2 Economic Instruments***

Beginning in the mid-1980s, governments in the OECD countries began to emphasize the use of economic instruments, either alone or in conjunction with traditional regulatory approaches. There appears to be some confusion about what to regard as economic instruments, due to different definitions used in different countries. Common elements for most economic approaches to coastal and marine management include:

- o Existence of financial stimuli;
- o Possibility of voluntary action;
- o Involvement of government (or closely related) authorities; and
- o Intention of (directly or indirectly) maintaining or improving environmental quality by applying the instrument.

The last element was brought in to distinguish between instruments that are intended to have a direct impact on behavior, and those that are intended solely or primarily to raise funds. In practice, instruments may have a mixed character and they may be intended to have one function, but operate as the other.

The following groups of economic instruments are identified as effective options by the OECD:

*Charges, including*

- User charges such as pollution fees;
- Product charges (like pollution fees, often used when volume of discharge can be assumed to relate to total production -- flat rates can limit incentives for new product development);
- Administrative charges;
- Tax differentiation (sometimes based on differential depreciation rates).

*Subsidies, including:*

- Grants;
- Soft loans;
- Tax allowances and holidays.

*Deposit refund systems.*

*Market creation, such as:*

- Emissions trading;
- Market intervention;
- Liability insurance.

*(Financial) enforcement incentives broken down into:*

- Non-compliance fees;
- Performance bonds.

Economic instruments contain a number of advantages over regulations, and offer stimuli for cleaner technologies:

- o They can be more cost effective by allowing the polluting activity to determine the most appropriate ways of meeting a given standard (as in the case of bubble offset, or trading systems) or by equating the marginal cost of treatment to the level of emissions charges across the whole range of activities.
- o They offer an ongoing incentive to reduce pollution below the levels determined by regulations. They also encourage the development of new pollution control technology and non-polluting products through research and development activities.
- o They increase flexibility. For the authorities, it is often easier to modify or adjust a charge than to change legislation or regulation; for polluters, the freedom to choose within an overall financial constraint is preserved.
- o They promote resource conservation and transmission to future generations in the same way that resource pricing does.

- o They provide a source of finance, which may be either directed to specific environmental programmes or used as a significant instrument in overall fiscal policy (*e.g.*, licensing of fishing fleets in the extended economic zones).
- o Economic instruments can be explained on the basis of the politically and socially attractive rationale that they ensure that the polluter pays.

It is acknowledged that uncertainty and lack of full information are constraints in the use of economic instruments. The possibility that economic instruments can promote resource conservation and that they could generate new sources of funds which might be used for environmental purposes make them particularly attractive for integrated coastal area management. As different instruments can fulfill management goals to different degrees, it is useful to consider them in the context of specific strategies.

There are styles and fads in environmental regulation just as there are in other aspects of public administration. Since the early-1980s, there have been many attempts to substitute market-based economic incentives for crude, command and control-based regulatory regimes. More recently, there have been attempts to systematize some positive experiences with environmental mediation and arbitration into a conflict resolution mode for environmental management.

The real lesson of these various initiatives seems to be that programmes need to carefully choose their implementation instruments from a full pallet of options, and that success is most likely to derive from the orchestration of several instruments, based on local and national considerations, rather than superb use of any one tool.

### ***5.5.3 Sample Policy Matrix***

A helpful mechanism to identify the convergence of problems and policy issues for coastal management instruments is a Policy Matrix. In such a matrix, policy elements are matched with existing problems so that actions can be identified. Table 5 gives an example which might be used in a large estuary.

Table 5. Sample Policy Matrix Illustrating the Convergence of Problems and Policy Issues for Coastal Management Instruments.

Policy Elements:	PROBLEMS			
	Pollution	Fisheries	Population	Economic Development
Basic Issues	External diseconomies	Common property resources	Land use	Growth policy Tax base
Current Policy Instruments	Regulation of emissions Command and Control	Regulation of gear Seasons	Planning/Zoning	Growth promotion Planning/Zoning Subdivision regulations
Flaws and Limitations	Inefficiency Lack of incentives Obsolescence	Legislated inefficient techniques	Social costs exceed private costs Sub optimization	Social costs exceed private costs National & Regional Competition
Needed Science Input	Dose-Response analysis Sustainability Damage estimates	Stock-Growth Models Sustainability	Land classes Hydrology Habitat Criteria for critical areas	Mass balance models Economic Models Sustainability
Interest Groups	Industrial Commercial Municipal	Fishermen Processors	Real estate agents Construction industry	Commercial groups Tourism businesses
Fairness Issues	Private vs. Social costs	Independence Open access to fisheries	Limits on property rights	Investors' and farmers' expectations
Alternative Policy Approaches	Pollution taxes & permits	Limits Property rights Aquaculture	Growth management Impact fees Marginal Cost pricing Compensation No net loss regs	Growth management Impact fees Marginal Cost pricing Compensation No net loss regs

## **5.6 Risk and Risk Assessment**

The word risk unfortunately has a dual meaning -- referring usually to either the probability of danger or to the hazard itself. When used as "risk assessment", however, the concept customarily combines the hazard with probability as well as its consequences, providing a third level definition

The four most common risks of concern within the context of the guidelines are resource depletion (e.g., mangroves and fish); habitat degradation (e.g., sewage); pollution (e.g., toxic waste and oil spills); and natural hazards (e.g., hurricanes).

Among these risks, probability figures customarily acquire significant public meaning only by comparison of the risk with something else. For example:

- (1) Natural background levels of risk before some environmental alteration or for some standard period.
- (2) The risk of alternatives (comparing choices).
- (3) Other risks in terms of probability.
- (4) Benefits associated with the risk (where risks are weighed against benefits or against an alternative set of risks and benefits).

Environmental risk assessment is a process that involves a search for an acceptable (best or midway) compromise between social benefits and environmental risk. Sometimes referred to as comparative risk assessment or ecological risk assessment, it is a relatively new scientific discipline which is adapting the health risk assessment processes developed by epidemiologists and public health statisticians to the measurement of environmental damages, based on exposure to pollutants and toxic materials.

For ICAM planners and managers, the more familiar use of risk assessment vocabulary is in the context of natural (and sometimes manmade) disasters and their effect on the environment. Risk in relation to natural disasters is really a subset of the larger risk concept, with special significance for coastal area planning and management in the Wider Caribbean Region, given the area's high frequency of hurricanes, earthquakes, volcanic eruptions and tsunamis.

### ***5.6.1 Ecological Risk Assessment and Risk Management***

The success of the ecological risk assessment movement can be measured by the fact that environmental risk assessment is only two years old.

The overall risk assessment/risk management model (Figure 11) originally proposed by the National Academy of Sciences (NAS) provided a clear separation of

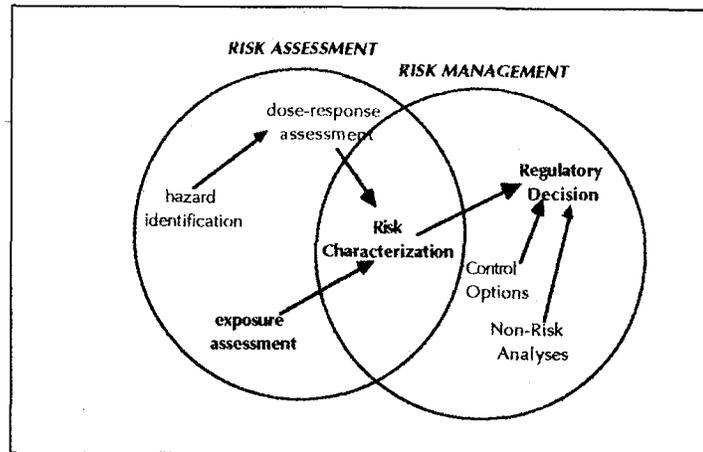


Figure 11. Risk Assessment/Risk Management Model proposed by the U.S. National Academy of Sciences. (Source: Patton, D.E., 1994 "The NAS Risk Paradigm as a Medium for Communication," *Risk Analysis*, 14(3):375-378.)

assessment and management, and provided a general framework for developing a theory of comparative risk.

The four questions the National Academy suggested which need to be answered by the risk assessment process are:

- |                                  |   |
|----------------------------------|---|
| <b>Hazard Identification:</b>    | <i>Is it toxic?</i>   |
| <b>Dose-Response Assessment:</b> | <i>How toxic is it?</i>                                       |
| <b>Exposure Assessment:</b>      | <i>Who is exposed to how much for how long and how often?</i> |
| <b>Risk Characterization:</b>    | <i>So what?</i>   |

Figure 12 shows the ecological risk assessment model now used by EPA's Risk Assessment Forum.

As scientists have gained experience with risk assessment, they have come to realize the critical importance of maintaining an ongoing dialogue between policy makers and scientists to ensure that answers being generated by researchers have real world users. This dialogue starts at Problem Formulation and continues through the model, with special concern for the Exposure and Effects analysis process.

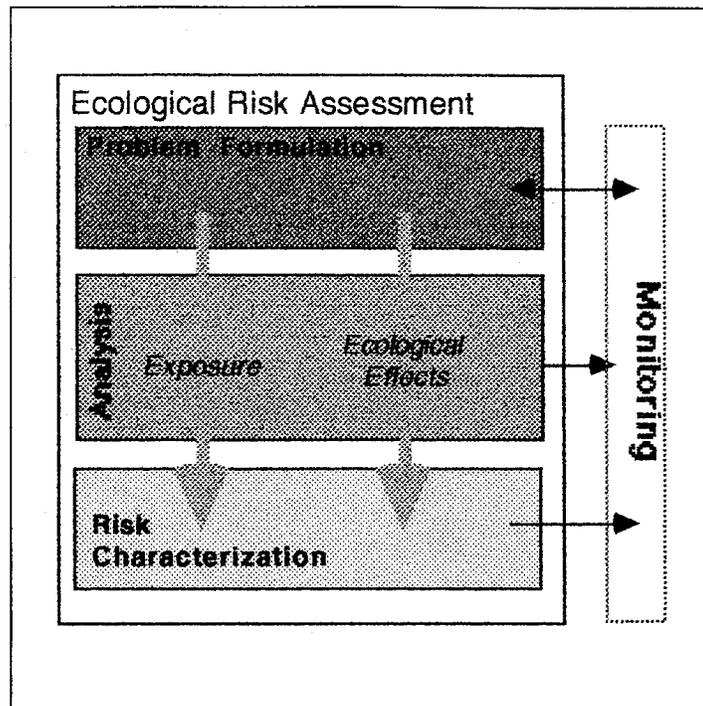


Figure 12. Ecological Risk Assessment Model now used by the U.S. EPA's Risk Assessment Forum.

The original NAS questions, as adapted to an environmental context, now look like:

- |                                  |  |
|----------------------------------|--|
| <b>Problem Identification:</b>   | <i>Is this stressful event, or introduced element dangerous to the ecosystem or region?</i>            |
| <b>Dose-Response Assessment:</b> | <i>How dangerous is it?</i>  |
| <b>Exposure Assessment:</b>      | <i>Which ecosystems or regions are exposed to how much of the stressor for how long and how often?</i> |
| <b>Risk Characterization:</b>    | <i>So what?</i>  |

The objective of these risk assessment/risk management models is to generate positive indicators of comparative risks to the environment. For example, risk assessment research on the Chesapeake Bay on the eastern coast of the United States resulted in a series of pollution control activities in the following sequence:

- o Reduction of toxic pollutants through point-source controls;
- o Reduction in nutrients through improved publicly-owned treatment works;
- o Reduction in nutrients and certain pesticides through improved management practices in the most intensively farmed portions of the Bay's watershed.

Each step in this process arose from a comparative assessment of the threats and probable returns from control actions addressing the next level of risk in the Bay's overall condition. (The programme now faces a dilemma that the next level of risk seems to derive from air-borne pollutants, which arise from either automobile exhausts, or from major air pollutant processes far from the Bay's watershed.)

Even with less sophisticated research support, the ecological risk assessment framework provides a systematic way to consider a variety of important influences on marine and coastal environments. One of the limitations of ecological risk assessment and management processes is that such planning exercises are so general in application that they tend to overlook the geographic nature of environmental risk. The geographic element is impossible to ignore in the case of disaster risk management.

### ***5.6.2 Disaster Risk Assessment and Management***

The natural environment is one of the largest losers in any natural or manmade disaster. The Wider Caribbean Region is susceptible to a high level of risk (exposure) from a wide variety of acute natural hazards, including hurricane, earthquake, volcanic eruption, floods, debris flows, and landslides. The region is also highly susceptible to marine oil and chemical spills from tanker collisions, given the high volumes of tanker traffic in and through the region. Other serious manmade disaster possibilities include cruise ship groundings and sinkings, and chemical or refinery disasters.

The World Bank and the Department of Regional Development and Environment of the Organization of American States have studied the economic impact of disasters. Their studies indicate a high benefit from public sector advance planning for disaster avoidance, mitigation, or post-disaster recovery (Table 6). These advantages must be even higher for coastal and marine areas. For hurricanes alone, the economic costs to specific Caribbean nations have been measured as equivalent to four months (Hurricane Gilbert in Jamaica in 1988) to *five years* (Hugo in Montserrat in 1989) of an island's Gross Domestic Product (OAS, 1994.). These costs can be expected to increase with increasing populations, tourism pressures and sea level rise from global warming.

Table 6. Hazard Prevention in Project Design (OAS, 1989).

	Type of Mitigation Measure	
	Structural	Non-Structural
Definition:	Physical measures or Design standards to reduce vulnerability	Policies and practices of development and investment to avoid natural hazard risk
Examples	Build levees, retaining walls, groins More stringent building standards Tree planting Coastal bulkheads/ reinforcements	Land use controls or zoning Forecasting & warnings Relocation Prevent deforestation; save other natural buffers (reefs, mangroves)
Implementation Costs	Substantial construction and retrofitting costs	Land use relatively cheap Forecasting/warning cheap Significant opportunity costs of foregone uses Substantial relocation costs (both economic & social)
Operation and Maintenance Costs	Protection structures can be expensive to maintain Geometric cost increases in the face of sea level rises	Enforcement (staff & legal) costs of land use regulation..).
Benefits	Costs avoided through reduced vulnerability	Costs avoided through reduced risk; benefits from alternative uses
Project Assessment Techniques	Benefit-Cost analysis	Cost effectiveness and cost-risk analysis

Coastal planners have special obligations to deal with disaster risk effects, since there are clear economic advantages from planned mitigation strategies, and because coastal area development is in danger of being further distorted by the reluctance of re-insurance companies to finance disaster risks in the coastal zone.

In the aftermath of disasters, natural resources often are further impacted by the recovery process, unless advance planning has identified specific risks which may exacerbate damages afflicted by the disaster itself. Major issues which need to be considered are:

- o rapid recovery of sewage treatment and waste disposal capabilities;
- o interim disposal of disaster wastes, especially activities which are likely to result in ground water injection or crushing and filling of estuarine fringe areas such as mangroves and fringing reef areas; and
- o rapid remediation actions for especially sensitive damaged resources, such as oil spills on mangroves or reefs with grounded vessels.

In Box 9, storm risk assessment in the Wider Caribbean is discussed.

### **Box 9. Storm Risk Assessment in the Caribbean**

Two significant factors in the large losses occurring from storms in the Caribbean are

- o the increasing costs of shoreline properties -- largely in response to increased values from tourism, and
- o extremely high population densities on islands affected by hurricanes (e.g., population density in North Carolina is 245 persons per square mile; the density of Barbados is over 1550 people per square mile).

In addition, there is a suspicion, especially on the part of re-insurance companies who determine the costs of insurance in the region, that the frequency of storms is returning to historic levels, after having been noticeably less frequent during the 20 years between 1970 and 1990. Finally, these fears are increasing insurance rates to the point that development is restricted.

In light of these factors, coastal planners have a special need to provide careful guidance on storm surges. Unfortunately, *continental storm surge models are not adequate* to the task on Caribbean islands.

In response to this problem, the OAS's Caribbean Disaster Mitigation Project (CDMP) has developed *TAOS* (The Arbiter of Storms), a computer-based model which can be employed with a variety of GIS (*Arc/INFO*, *IDRISI*, or *GRASS*) to produce more accurate wind force estimates, storm surge heights, and wave heights at the coastline. This model produces more accurate results for island systems, and is easier to use than alternatives, such as the *WHAFIS* model of the U.S. Federal Emergency Management Agency, and *SLOSH* of the U.S. National Oceanic and Atmospheric Administration. The model uses standard "off-the-shelf" data sources, such as satellite imagery for necessary coastal bathymetry, digital terrain data models, and U.S. National Hurricane Center databases.

*(The TAOS model is more completely described in paper entitled, "New Technology for Improved Storm Risk Assessment in the Caribbean," by Jan C. Vermeiren and Charles C. Watson, Jr., available from the Organization of American States, Department of Regional Development and Environment, Caribbean Disaster Mitigation Project, Washington, 1994.)*

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## CHAPTER 6. NEW CONCEPTS AND RECOMMENDATIONS

ICAM is a proven process with an unfinished agenda and an evolving list of required adaptations (the ecosystem challenge discussed in Section 5.2.3, for example). Dr. B. Cincin-Sain (1993) is perceptive when she uses the analogy of a "developing synthesis model" to describe the current evolutionary status of ICAM. This point tends to be less reassuring to the neophyte coastal planner (who worries more about the "changes") than to the experienced coastal expert who appreciates the flexibility of ICAM because it is dynamic and perpetually in a creative state of flux. New approaches and opportunities are now beginning to confirm the original assumption that ICAM is a practical and effective framework for addressing coastal resource management.

### 6.1 The Value of ICAM

ICAM's strategic value to national societies in the Wider Caribbean Region is as a vehicle for quietly but forcefully reshaping domestic town and country and regional sectorial planning along more holistic lines with:

- (1) a stronger commitment to place;
- (2) a more receptive perspective on science;
- (3) a more sensitive appreciation of an ecosystem -- natural and human; and
- (4) a more dynamic planning process that incorporates an action agenda and encourages institutional innovation and integrative strategies.

This contribution to regional development is perhaps as important as ICAM's constructive guidance for coastal resource use in the direction of more democratic and more sustainable kinds of development.

ICAM planning in the region, however, needs also to recognize that good planning arises from the conditions of the place, *including* the public environmental policy framework. Planning without a suitable supporting policy framework will, at best, fall victim to the implication of piecemeal implementation and will fail to do justice to the planner's vision, the supporting ecosystem, and those citizens who are its inhabitants. An improved policy framework, however, is generally predicated on an upgrade of implementing institutions, including NGOs.

For this reason alone, adjusting the horizons for ICAM goal setting becomes very important. It is necessary to elevate its customary focus from environmental values to the cause of operational effectiveness of governmental management processes *vis a vis* the environment. Goals and justification would shift, therefore, from environmentalism *per se* (as being diffuse) to the cause of moving coastal

and marine issues higher on the list of priority concerns which drive public decision-making.

Put another way, environmental values have public value, but so do facilitating and institutionalizing public policy, public decisions, and public action that *guarantee* public enjoyment of a clean environment, public health, and publicly-supported coastal amenities maintained for the public good.

## **6.2 Monitoring and Evaluation: New Approaches**

The results of the ICAM programme should be subject to regular monitoring and evaluation as a way of continually improving the process. It is especially important, therefore, that the goals of the overall ICAM effort and the goals and objectives of individual management and/or action projects be specified as clearly and as quantitatively as possible. Otherwise assessment as to how well they are being achieved are difficult.

The internal programme monitoring procedure should include:

- (1) identification of expected performance;
- (2) assessment and/or measurements of the actual performance of the programme;
- (3) establishment of performance variances (e.g., shortcomings or excesses); and
- (4) procedure for communicating variances that exceed pre-established limits to the appropriate management or enforcement and implementation authorities.

Active participation in regional monitoring initiatives supported by the Caribbean Environment Programme and IOCARIBE, among others, will be important, as will arrangements for data and information exchanges among all levels of participating institutions, whether international, regional, national or sub-national. (See also Section 5.1 on Information Management and Section 6.3 on Science's Role in Managing Coastal Systems.)

The recent development of customized monitoring manuals within the region on coral reef productivity and management, wetlands, mangroves, seagrasses, and sediment reduction in coastal run-off are a good start. The process of testing existing manuals and developing additional field guides as required needs to be pursued aggressively.

Traditional project or programme evaluation is similar to a donor's "post audit". It asks questions after the fact about how well the project went, presumably seeking to inform the next effort with lessons learned. In recent years, donors and project managers have developed an improved evaluation technique that focuses more on:

- o ongoing complex projects as part of larger programmes;
- o projects with many layers and levels of participation and/or institutions; and
- o projects with broad social goals and specific behavioral change objectives.

The new evaluation process is called "strategic evaluation" because it becomes part of the strategy as an immediate feedback loop or mid-course correction.

Strategic evaluation embraces and blends together two proven elements long accepted as effective:

- (1) a tradition which holds that evaluation must involve the people, including the alleged beneficiaries and those associated with the project or programme under review; and
- (2) the principles of "action research" evaluation which state that any evaluation of an ongoing project will inevitably change the activity and can make improvements by the process, thus making the evaluation process more than a judgmental review.

In these ways, strategic evaluation differs markedly from more traditional evaluation forms and meshes well with an ICAM-type national or regional programme. Project participants (including beneficiaries) are treated as stakeholders in the pursuit of improved coastal conditions, and their collective counsel is elicited regarding how the programme (or project) can be improved in the next ensuing phase. The group is also required to review its own performance. The older and newer forms of evaluation are not mutually exclusive, however, and can be used in tandem.

The strategic method used with participant groups is very similar to the GTZ "ZOPP" and the USAID "Log-Frame" in developing flip-chart-type problem trees, issue trees and action trees to achieve a degree of clarity and focus leading to mutually planned actions to improve working relationships and the project's momentum and impact as a whole. In this strategic evaluation format, action is inherent in the process, and the evaluator is more a process facilitator whose leadership skills must be superb but non-threatening.

Using this approach, an orientation toward the future and toward planning (and the investment of time and effort in change) is merged with evaluation's more retrospective focus. In this way, strategic evaluation parallels strategic planning.

### **6.3 Science's Role in Managing Coastal Systems**

The importance of a better understanding of and predictive capability concerning the coastal and ocean environments is critical. Chapter 17 of UNCED's Agenda 21 calls for new approaches to "integrated management and sustainable development of coastal and marine areas, including exclusive economic zones". It also calls upon countries "to cooperate in the development of necessary coastal systematic observation, research, and information management systems". UNCED acknowledges that sustainable use, or integrated management, requires an information basis which has been obtained through the use of scientifically valid methods, and that international cooperation is needed to develop and integrate systematic observation programmes.

Agenda 21 also points out that national and regional capacity building are critical. Both internally and through international assistance programmes, mechanisms are needed to establish environmental management capabilities, including human resources. National institutions responsible for marine and coastal environmental issues, including research, monitoring and management, need to be established or strengthened in many countries. Science skills at all levels of government agencies involved with resource management will need upgrading.

#### ***6.3.1 National Needs***

Our focus begins within individual countries. The ecological systems of the coastal areas of each, as well as the socio-economic development of these areas, are heavily influenced by the conditions created by the proximity of the ocean. Nowhere is this mutual interdependence and influence more evident than in the coastal and nearshore zones of the tropics. Yet few countries in the Wider Caribbean Region have adequate information on the state of their coastal and marine resources, although such information is essential for basic resource management in a sustainable mode.

Scientific input is required for essentially all aspects of integrated coastal planning and management, for example:

- for mapping,
- for the establishment of baseline conditions,
- for data management,

- for the quantification of problems and their causes,
- for predictive modelling,
- for impact assessment,
- for the formulation of mitigation measures, and
- for systematic long-term monitoring.

Unfortunately, our scientific understanding of the majority of coastal processes and systems is far from complete.

The variety of tasks, functions and activities involved in supporting an integrated coastal area management programme is often not appreciated and therefore comes as a surprise. Table 7 is drawn from an ongoing ICAM programme in Barbados. It illustrates the great diversity of tasks involved in the final stages of system diagnostics and technical studies, pilot project testing, and ICAM planning activities. It also illustrates the breadth of subject matter required for scientific and technical literacy in the field of coastal resource management.

It is apparent from Table 7 that the majority of coastal zone problems are cross-sectorial and can only be solved through an interdisciplinary approach, even where one or two sectors are the main forces driving development. Additionally, the dynamics of coastal oceans -- combined with the potential influence of activities within coastal drainage basins -- means that international cooperation and co-ordination is required to address a multitude of problems which extends beyond national and even regional boundaries.

### ***6.3.2 Issue-based Transnational Linkages***

Coastal management issues that transcend local coastal boundaries, and which must therefore be considered in a broader context, include regional problems, such as the pollution and degradation of habitats in semi-enclosed seas like the Caribbean, or at a global scale, issues such as global warming and accelerated sea-level rise. There is a strong need for scientific input to address regional and global ICAM issues, which can be simultaneously brought to bear on problems at the national or even local level. The support of international and regional bodies is critical in achieving this goal -- particularly where intergovernmental agreements are necessary for effective ICAM.

Linkages will emerge between national ICAM programmes and current international initiatives on a wide variety of issues, for example, biodiversity conservation, marine debris, migratory species, hazardous waste, wetlands protection, global warming, large ecosystem monitoring and research, and many other similar topics.

Table 7. Barbados ICAM Planning: Main Tasks in Technical Feasibility Study (Final Phases).

COASTAL ENGINEERING	TERRESTRIAL WATER	MARINE WATER AND EIA	SOCIO-ECONOMICS	PILOT PROJECTS
<ol style="list-style-type: none"> <li>1. Data Acquisition                             <ul style="list-style-type: none"> <li>• Wind, Wave, Current, Tide, Sediments, Bathymetry</li> </ul> </li> <li>2. Shoreline mapping</li> <li>3. Wave Climate Determination                             <ul style="list-style-type: none"> <li>• Deep and nearshore</li> <li>• West &amp; South coasts</li> </ul> </li> <li>4. Tides &amp; Water Levels</li> <li>5. Coastal Water Circulation</li> <li>6. Shoreline Characterization                             <ul style="list-style-type: none"> <li>• Sediment Pathways, Transport Rates</li> <li>• Shoreline Predictions</li> <li>• Sand Nourishment Sources</li> </ul> </li> <li>7. Beach/Coast Improvement Techniques                             <ul style="list-style-type: none"> <li>• Structural</li> <li>• Non Structural</li> <li>• Drainage stabilization</li> <li>• Pilot Project design</li> </ul> </li> <li>8. Pilot Project Monitoring</li> <li>9. Maintenance Practices</li> <li>10. Pre Investment Designs</li> <li>11. CZM Plan</li> </ol>	<ol style="list-style-type: none"> <li>1. Data Acquisition                             <ul style="list-style-type: none"> <li>• Sewage, Fertilizers, Pesticide, Hydrogeology</li> <li>Lab capabilities, Ranking Pollution Impacts</li> </ul> </li> <li>2. Measurement Programme                             <ul style="list-style-type: none"> <li>• Surface flow</li> <li>• Rainfall</li> <li>• Subsurface flow</li> <li>• Water Quality Sampling</li> </ul> </li> <li>3. Analysis &amp; Modelling</li> <li>4. Control Options (Evaluation)                             <ul style="list-style-type: none"> <li>• Agriculture management</li> <li>• Sewage collection</li> <li>• Storm Water Management</li> <li>• Education</li> <li>• Legislation</li> </ul> </li> <li>5. CZM Plan</li> </ol>	<ol style="list-style-type: none"> <li>1. Data Acquisition                             <ul style="list-style-type: none"> <li>• Sewage, Fertilizers, Pesticides, Lab Capabilities</li> <li>• Reef &amp; Seagrass monitoring</li> <li>• Vegetation identification</li> </ul> </li> <li>2. Marine Ecosystem Threshold</li> <li>3. EIA Pilot Project</li> <li>4. General Environmental Scoping</li> <li>5. CZM Plan</li> </ol>	<ol style="list-style-type: none"> <li>1. Develop CBA model</li> <li>2. Tourism &amp; Recreation                             <ul style="list-style-type: none"> <li>• Demand /Supply</li> <li>• Beach Requirement</li> </ul> </li> <li>3. Land Use Issues                             <ul style="list-style-type: none"> <li>• Regulations</li> <li>• Zoning</li> <li>• Open Access</li> <li>• Coastal Structures &amp; Implications</li> </ul> </li> <li>4. Analysis of / Land Use Control</li> <li>5. Public Participation Programmes</li> <li>6. CZM Plan</li> </ol>	<ol style="list-style-type: none"> <li>1. Evaluation of Engineering options relative to Coastal Problems</li> <li>2. Select main options for further experimentation</li> <li>3. Design Pilot Projects                             <ul style="list-style-type: none"> <li>• Beach Face Dewatering</li> <li>• Beach Rock Removal</li> <li>• Submerged Breakwaters</li> <li>• Berm-type Revetment</li> <li>• Beach Nourishment</li> <li>• Reef Rubble Clearing</li> </ul> </li> <li>4. Modification of existing structures</li> <li>5. CZM Plan</li> </ol>

Source: Atherley, *et al.*, 1993.

These linkages will vary widely from full support networks of kindred scholars and professional managers to E-mail information exchange networks to groups with a common problem or perspective forming to lobby an international body for action or protection, technical assistance, and even support programme funding.

Effective ICAM can be achieved through better coordination among national, regional and international organizations and institutions. Such coordination will help to avoid unnecessary duplication, and will enable the development of the concepts, tools and networks that will be needed to facilitate the complex process of developing and implementing national ICAM programmes.

There is a wide variety of international, regional, bilateral and non-governmental organizations with an active interest in the promotion and support of integrated coastal management. In recent years, there has been a proliferation of technical assistance programmes aimed at assisting coastal management programmes. This has had both positive aspects, such as improved funding and a growing body of expertise, as well as negative aspects, for example, competition, duplication of efforts, non-standardized approaches.

#### **6.4 Coastal Landscapes: New Approaches**

Coastal landscapes throughout the Wider Caribbean are mostly taken for granted but are, nonetheless, an important cultural and economic resource for any country with shoreline. They are, in one sense, an undervalued national treasure -- a blend of natural history and human history in action and a cultural artifact worthy of preservation. In the developed world, strong measures are often taken to identify, preserve and delicately exploit coastal landscape quality. The result is a planned environment -- part natural and part man-made but with an appreciation for balance, beauty and sustainability. However, for the most part in the Wider Caribbean, until now, other priorities have prevailed, and the significance of the landscape, and seascape as well, has often been overlooked.

The attention of the conservationist has been focused elsewhere, and the prevailing philosophy has generally been one of *laissez-faire*. Nevertheless, coastal landscapes -- like a good farm -- require good resource management and husbandry. A system of beaches or estuaries or offshore cays or coral reefs, if left alone in an unplanned, unmonitored and unmanaged state, will mostly -- save for coastal urban areas -- lie fallow, harassed only by time and the occasional storm or hurricane.

For the ICAM planner/manager, addressing coastal landscapes is an exceptionally difficult but compelling challenge for the following reasons.

1. There is no national practice, tradition or tested and proven strategy of landscape management anywhere in the region.
2. The North American practice of relying on vast reaches of open space for the "buffering" of impacts, instead of a tight management perspective, has had an unfortunate influence on regional planners who have been trained in both Canada and the United States.
3. Fragmented and layered sub-national state and local planning units seldom undertake landscape management initiatives at the macro scale needed. When landscape/seascape planning is done, it is customized, site specific and triggered by the client, not the vision of the planner. The exception would be the occasionally well-planned but narrow stretch of scenic coastal highways that

have been suitably engineered for striking seascape vistas. But these are engineering not planning achievements in most cases.

4. Bilateral and multilateral donor-funded infrastructure in the region's coastal zones has universally been notably spartan and unaesthetic, lacking much semblance of thoughtful planning dialogue about scenic impact mitigation or optimum routing for other than cost factors.

One recent evaluation study from the region funded by the Canadian International Development Agency (CIDA) focused on a new coastal highway where the final road routing was done by computer on a shortest route/lowest cost, least "cut and fill" basis. This produced excessive grades and steep unstable side slopes in the deep cuts which are prone to high erosion rates and landslide risk in an area immediately adjacent to the clearest water and best undeveloped beaches in the entire country. For the Caribbean coastal system manager, this is a classic case study in the complexities of balancing local landscape characteristics and ecosystem needs against donor-driven, minimum-cost project design requirements.

### **6.5 Programme Comparisons, Assessments and Lessons Learned**

What is the best way to make use of ICAM success stories from countries and territories which have experimented with the process and have a functional programme? Researchers have devised a tentative typology characterizing how programmes differ, and a list of variables that would serve in any comparative assessment (Cicin-Sain, 1993).

There is a risk, however, in jumping to conclusions about the value of comparing successes and using the most successful (as opposed to the most comparable location or country) as models. An examination of the failed aspects of partial successes with comparability would tend to be more instructive. It is not possible to replicate any successful model *per se*; in fact, what "worked" elsewhere has a high risk of not working in a new location. Therefore, lessons learned from neighboring "failures" are more likely to be truly instructive than success stories from the same neighbor. Likewise, marginal successes, and the mistakes made, from a comparable location are better models than the best success story from another time and differing place.

The more formative approach to learning is "lesson drawing", using examples drawn from another time and place. As reported in Cicin-Sain (1993), these include:

- (1) copying (more or less intact adoption of a programme already in effect elsewhere);
- (2) emulation (adoption with adjustment for different circumstances);

- (3) hybridization (combining elements of programmes from two different places);
- (4) synthesis (combining familiar elements from programmes in effect in 3 or more places);
- (5) inspiration (programmes elsewhere used as intellectual stimulus for developing a novel programme without an analogue elsewhere).

Two more could be added:

- (6) consultation (seeking counsel from someone with direct knowledge) and
- (7) absorption/osmosis (employing someone who worked directly on the previous initiative).

The assumption in the latter is that "osmotic learning" is more subtle and more effective. Who would know better what mistakes were made and how to avoid them?

Each generation inherits historically damaged beaches, reefs, even entire coastlines, and the present generation has made some of its inheritance worse in the rush to develop -- oftentimes overlooking both adverse side effects and development alternatives. In areas of seriously damaged landscapes and seascapes, truly sustainable development *requires* ecosystem restoration.

The ICAM framework forces an expansion of geographical, conceptual and disciplinary boundaries. It forces more focus on mechanisms of intervention and constructive management for sustainable use, not just for one country or a piece of a shoreline but for the region, as more than the sum of its parts -- coastal and marine from watershed to EEZ.

This regional assemblage is, of course, the same large marine ecosystem at risk referred to in Chapter 2. These are the same marine and coastal resources that underpin the economies of most of the bordering states of the region. For this reason, common sense dictates that such assets warrant optimum management and protection practices if sustainable use is the ultimate goal. Furthermore, a custodial overview of system gains and losses is important. As a routine, regional maintenance task, a "balance sheet" of system gains and losses will help define the calculus of people, place and nature -- the human ecology of the Wider Caribbean Region.

One way to ensure that this process of regional resource husbandry and "accounting" is done efficiently is for national-level resource management units to develop integrated coastal area management programmes. UNEP's Caribbean Environment Programme can provide a facilitating role in the Wider Caribbean Region through

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its Regional Programmes. The energizing, organizing vehicle is ICAM. The beneficiaries are the people, the countries, and the institutions of the Wider Caribbean Region.

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## REFERENCES

*This is a list of bibliography sources relevant for ICAM/Wider Caribbean which were either used in the text or can be recommended to the users of this document for reference in the implementation of ICAM in the Wider Caribbean.*

- Archer, A.B., 1976. *Marine Pollution Off Barbados' Coasts*. Prepared for Meeting of the Smaller Caribbean Islands on Oil Spill Contingency Planning, San Juan, Puerto Rico, 16-20 June 1980 (Agenda Item 10). Sponsored by Organization of American States, Inter-governmental Maritime Consultative Organization, United Nations Environment Programme.
- Atherley, K.A., D.A. Smith, and L.A. Nurse, 1993. "An Integrated Coastal Zone Management Programme for Barbados." In: *Proceedings for Coastal Zone '93:2653-2667*.
- Awosika, L., S. Boromthananat, R. Comforth, M. Hendry, R. Koudstall, M. Ridgley, S. Sorenson, L. De Vrees, and S. Westmacott, 1993. *Management Arrangements for the Development and Implementation of Coastal Zone Management Programmes*. World Coast Conference Organising Committee. International Conference on Coastal Zone Management, The Netherlands, 1-5 November 1993.
- Bass, S.M.J., 1993. "Ecology and Economics in Small Islands: Constructing A Framework for Sustainable Development." In: E.B. Barbier, ed., *Economics and Ecology: New Frontiers and Sustainable Development*. Chapman & Hall, London.
- Beller, W.S., ed., 1986. *Proceedings of the Interoceanic Workshop on Sustainable Development and Environmental Management of Small Islands, Humacao, Puerto Rico, November 3-7, 1986*. U.S. Man and the Biosphere Programme, Department of State, Washington, DC.
- Brower, D.J. and D.S. Carol, 1987. *Managing Land-use Conflicts. Case Studies in Special Area Management*. Duke University Press, Durham, NC. USA.
- Brower, D.J., T. Beatley, and D.J.L. Blatt, 1987. *Reducing Hurricane and Coastal Hazards Through Growth Management*. University of North Carolina at Chapel Hill, NC. USA.
- Cambers, G., 1992. *Coastal Zone Management: Case Studies from the Caribbean*. Latin America and the Caribbean Technical Department, Regional Studies Programme. Report No. 26. The World Bank.
- Caribbean Community Secretariat, 1992. *CARICOM Regional Environment Programme*. Georgetown, Guyana.
- Caribbean Conservation Association and Island Resources Foundation, 1991. *Antigua and Barbuda Environmental Profile*. Prepared for Government of Antigua-Barbuda and the U.S. Agency for International Development, Regional Development Office for the Caribbean/Barbados.
- Caribbean Conservation Association and Island Resources Foundation, 1991. *Dominica Environmental Profile*. Prepared for the Government of the Commonwealth of Dominica and the U.S. Agency for International Development, Regional Development Office for the Caribbean/Barbados.

## ***Integrated Coastal Area Management***

---

- Caribbean Conservation Association and Island Resources Foundation, 1991. *Environmental Agenda for the 1990's. A Synthesis of the Eastern Caribbean Country Environmental Profile Series*. Prepared for U.S. Agency for International Development, Regional Development Office for the Caribbean/Barbados.
- Caribbean Conservation Association and Island Resources Foundation, 1991. *Grenada Environmental Profile*. Prepared for the Government of Grenada and the U.S. Agency for International Development, Regional Development Office for the Caribbean/Barbados.
- Caribbean Conservation Association and Island Resources Foundation, 1991. *St. Kitts and Nevis Environmental Profile*. Prepared for the Government of St. Kitts-Nevis and the U.S. Agency for International Development, Regional Development Office for the Caribbean/Barbados.
- Caribbean Conservation Association and Island Resources Foundation, 1991. *St. Lucia Environmental Profile*. Prepared for the Government of St. Lucia and the U.S. Agency for International Development, Regional Development Office for the Caribbean/Barbados.
- Caribbean Conservation Association and Island Resources Foundation, 1991. *St. Vincent and the Grenadines Environmental Profile*. Prepared for the Government of St. Vincent and the Grenadines and the U.S. Agency for International Development, Regional Development Office for the Caribbean/Barbados.
- Cicin-Sain, B., 1982. "Management of Marine Conflicts." In: R.H. Stroud, ed., *Marine Recreational Fisheries* (pp. 127-140). International Game Fish Association, National Coalition for Marine Conservation, and Sport Fishing Institute.
- Cicin-Sain, B., 1993. "Sustainable Development and Integrated Coastal Management." *Ocean and Coastal Management*, 21(1993):11-43. Elsevier Science Publishers Ltd., England.
- Clark, J., ed., 1985. *Coastal Resources Management: Development Case Studies*. Renewable Resources Information Series, Coastal Management Publication No. 3. Prepared by Research Planning Institute, Inc. Columbia, SC for U.S. National Park Service and U.S. Agency for International Development.
- Clark, J., 1992. *Integrated Management of Coastal Zones*. FAO Fisheries Technical Paper 327. Food and Agriculture Organization of the United Nations, Rome.
- Collymore, J., F. McDonald, and H. Brown, 1993. *Natural and Environmental Disaster Preparedness in the Caribbean*. Background Paper for the Regional Technical Meeting on the Sustainable Development of Small Island Developing States, Port-of-Spain, Trinidad and Tobago, July 12-16, 1993.
- Coughanowr, C. and G. Kullenberg, 1993. "On the Need for Scientific Input on an International Scale: The Intergovernmental Oceanographic Commission's Perspective on Integrated Coastal Management." *Ocean and Coastal Management*, 21(1993):339-352. Elsevier Science Publishers Ltd., England.
- Cox, J and C. Embree, eds., 1990. *Sustainable Development in the Caribbean*. A Report on the Public Policy Implications of Sustainable Development in the Caribbean Region Conference, May 28-30, 1990, Kingston, Jamaica. Institute for Research on Public Policy, Halifax, NS, Canada.

- Crawford, B.R., J.S. Cobb, and A. Friedman, 1993. "Building Capacity for Integrated Coastal Management in Developing Countries." *Ocean and Coastal Management*, 21(1993):311-337. Elsevier Science Publishers Ltd., England.
- Dalhousie Ocean Studies Programme, 1984. *Development and Ocean Management in the Eastern Caribbean: The Case of the Leeward Islands*. Prepared as background material for a regional seminar held in Basseterre, St. Kitts, 7-9 June 1983, sponsored by CIDA. Dalhousie University, Halifax, NS, Canada.
- Davies, J.C., V.T. Covello, and F.W. Allen, 1986. *Risk Communication*. Proceedings of the National Conference on Risk Communication, held in Washington, DC, Jan. 29-31, 1986. The Conservation Foundation, Washington, DC.
- de Groot, R.S., 1986. *A Functional Ecosystem Evaluation Method As a Tool in Environmental Planning and Decision Making*. Nature Conservation Department, Agricultural University, Wageningen, The Netherlands.
- Dixon, J.A., L.F. Scura and T. van't Hof, 1992. *Meeting Ecological and Economic Goals: The Case of Marine Parks in the Caribbean*. Prepared for the Second Conference on the Ecology and Economics of Biodiversity Loss of the Beijer Institute, July 29-31, 1992, Stockholm, and also presented at the Second Meeting of the International Society for Ecological Economics, Stockholm, August 3-6, 1992.
- Gamman, J.K., 1990. *A Comparative Analysis of Public Policies Affecting Natural Resources and the Environment: Interest Group Politics in the Eastern Caribbean*. Prepared under the DESFIL Programme of USAID by Development Alternatives, Inc., Washington, DC.
- Gamman, J.K., 1990. *Environmental Policy Implementation in Developing Countries*. Ph.D. Dissertation, Massachusetts Institute of Technology, USA.
- Goodwin, M., et al., 1985. *Fishery Sector Assessment for the Eastern Caribbean: Antigua/Barbuda, Dominica, Grenada, Montserrat, St. Christopher/Nevis, St. Lucia, St. Vincent and the Grenadines*. Prepared by Island Resources Foundation for USAID. St. Thomas, Virgin Islands.
- Griffith, M. and J. Ashe, 1993. "Sustainable Development of Coastal and Marine Areas in Small Island Developing States: A Basis for Integrated Coastal Management." *Ocean and Coastal Management*, 21(1993):269-284. Elsevier Science Publishers Ltd., England.
- Godschalk, D.R., D.J. Brower, and T. Beatley, 1989. *Catastrophic Coastal Storms. Hazard Mitigation and Development Management*. Duke University Press, Durham, NC. USA.
- Hendry, M.D., 1993. *Production of The Coastal Zone Management Plan and Phase I Investment Project (Final)*. DELCAN International Ltd., Feasibility Studies in Coastal Conservation. Prepared for Ministry of Housing, Lands and Environment, Government of Barbados.
- Hirvonen, H. and R.P. Cote, 1986. "Control Strategies for the Protection of the Marine Environment." In: *Marine Policy*:19-28. Butterworth & Co. (Publishers) Ltd.
- Hudson, B.J., 1986. "Landscape as Resource for National Development: A Caribbean View." *Geography*:116-121.

## ***Integrated Coastal Area Management***

---

- Intergovernmental Oceanographic Commission, 1989. *IOC-UNEP Regional Workshop to Review Priorities for Marine Pollution Monitoring, Research, Control and Abatement in the Wider Caribbean. San Jose, Costa Rica, 24-30 August 1989.* Workshop Report No. 59. UNESCO.
- Intergovernmental Oceanographic Commission, 1993. *IOC Workshop on Small Island Oceanography in Relation to Sustainable Economic Development and Coastal Area Management of Small Island Developing States. Fort-de-France, Martinique, 8-10 November 1993.* Workshop Report No. 97. UNESCO.
- Intergovernmental Oceanographic Commission, Reports of Governing and Major Subsidiary Bodies, 1993. *IOC Sub-commission for the Caribbean and Adjacent Regions. Fourth Session, Veracruz, Mexico, 2-7 December 1992.* UNESCO, IOC/SC-IOCARIBE, Paris.
- Intergovernmental Oceanographic Commission, Reports of Meetings of Experts and Equivalent Bodies, 1993. *IODE Group of Experts on Marine Information Management. Fourth Session, Washington, DC, USA, 6-9 October 1993.* UNESCO, IOC/IODE, Paris.
- Intergovernmental Oceanographic Commission, Subcommission for the Caribbean and Adjacent Regions (IOCARIBE), 1991. *Global Change and Coastal Land Loss: Management and Decision-making in Support of Sustainable Development Within the Caribbean and Adjacent Regions.* A Programme Proposal. IOCARIBE, Cartagena, Colombia.
- Intergovernmental Oceanographic Commission/United Nations Environment Programme (IOC/UNEP), 1992. *First Meeting of the CEPPOL Group of Experts, Kingston, 12-14 May 1992.* UNEP (OCA)/CAR WG.6/1.
- Intergovernmental Oceanographic Commission/United Nations Environment Programme (IOC/UNEP), 1993. *Second CEPPOL Seminar on Monitoring and Control of Sanitary Quality of Bathing and Shellfish-Growing Marine Waters in the Wider Caribbean, Kingston, Jamaica, 9-13 August 1993.* CEP Technical Report No. 23. UNEP, Caribbean Environment Programme, Kingston, Jamaica.
- Intergovernmental Panel on Climate Change, 1994. *Preparing To Meet the Coastal Challenges of the 21st Century.* Conference Report of the World Coast Conference 1993, Noordwijk, The Netherlands, 1-5 November, 1993.
- International Institute for Environment and Development, 1985. *Haiti, Country Environmental Profile: A Field Study.* Prepared for U.S. Agency for International Development.
- International Institute for Environment and Development, 1987. *Jamaica Country Environmental Profile.* Prepared by Ralph M. Field Associates, Inc. for Government of Jamaica and the U.S. Agency for International Development.
- Island Resources Foundation, 1977. *Marine Environments of the Virgin Islands.* Technical Supplement No. 1. Prepared for Virgin Islands Planning Office, Coastal Zone Management Programme, St. Thomas, Virgin Islands.
- Island Resources Foundation, 1993. *Anguilla Environmental Profile.* Prepared for the Government of Anguilla and the United Nations Development Programme, Barbados.
- Island Resources Foundation, 1993. *Montserrat Environmental Profile.* Prepared for the Government of Montserrat and the United Nations Development Programme, Barbados.

- Jernelov, A. and U. Marinov, 1990. *An Approach to Environmental Impact Assessment for Projects Affecting the Marine Environment*. UNEP, Regional Seas Reports and Studies, No. 122.
- JRB Associates, Inc., 1981. *Dominican Republic: Country Environmental Profile. A Field Study*. Prepared for U.S. Agency for International Development.
- Kelleher, G. and R. Kenchington, 1992. *Guidelines for Establishing Marine Protected Areas*. A Marine Conservation and Development Report. IUCN, Gland, Switzerland.
- Ketchum, B.H., ed., 1972. *The Water's Edge: Critical Problems of the Coastal Zone*. The MIT Press, Cambridge, MA, USA.
- Knausenberger, W.I. and C.B. Fleming, 1989. *Proceedings of the Workshop on Coastal Protected Areas in the Lesser Antilles*. V.I. Cooperative Extension Service and Eastern Caribbean Center, University of the Virgin Islands.
- Knecht, R.W. and J. Archer, 1993. "'Integration' in the US Coastal Zone Management Programme." *Ocean and Coastal Management*, 21(1993):183-199. Elsevier Science Publishers Ltd., England.
- Lewsey, C.D., 1990. *Reassessing Policy Alternatives for Sustainable Development in Coastal Areas: Implications for the CARICOM Caribbean*. Paper presented at Conference on Public Policy Implications of Sustainable Development in the Caribbean, Kingston, Jamaica, May 28-30, 1990. Sponsored by the Government of Jamaica and the Institute for Research on Public Policy, Ottawa, Canada.
- Mattson, J.S. and J.A. DeFoor, 1985. "Natural Resource Damages: Restitution As A Mechanism To Slow Destruction of Florida's Natural Resources." *Journal of Land Use and Environmental Law*, 1(3):295-319.
- Maul, G.A., 1993. *Ecosystem and Socioeconomic Response to Future Climatic Conditions in the Marine and Coastal Regions of the Caribbean Sea, Gulf of Mexico, Bahamas and the Northeast Coast of South America*. Caribbean Environment Programme (CEP) Technical Report No. 22. UNEP/CEP, Kingston, Jamaica.
- McConnell, M.L. and E. Gold, 1991. "The Modern Law of the Sea: Framework for the Protection and Preservation of the Marine Environment." *Journal of International Law*, 23(1):83-105.
- McElroy, J., 1978. *Economic and Social Impacts of the Virgin Islands Coastal Zone Management Programme*. Technical Supplement No. 4. Prepared for the Virgin Islands Planning Office, Coastal Zone Management Programme, St. Thomas, Virgin Islands.
- Natural Resources Defense Council, Inc., 1976. *Who's Minding the Shore? A Citizens Guide to Coastal Management*. Prepared for U.S. Department of Commerce, NOAA, OCZM, Washington, DC.
- Nurse, L.A., 1990. "The Deterioration of Caribbean Coastal Zones: A Recurring Issue in Regional Development." In: J. Cox and C. Embree, eds., *Sustainable Development in the Caribbean*. A Report on the Public Policy Implications of Sustainable Development in the Caribbean Region Conference, May 28-30, 1990, Kingston, Jamaica. Institute for Research on Public Policy, Halifax, NS, Canada.

## ***Integrated Coastal Area Management***

---

- Nurse, L.A., 1992. *Coastal Conservation Project Unit Annual Report for the Year 1991-1992*. Prepared for the Ministry of Environment, Housing and Lands, Government of Barbados.
- Ogden, J.C. and E.H. Gladfelter, 1983. *Coral Reefs, Seagrass Beds and Mangroves: Their Interaction in the Coastal Zones of the Caribbean*. Report of a Workshop held at West Indies Laboratory, St. Croix, U.S. Virgin Islands, May 1982. UNESCO Reports in Marine Science No. 23. UNESCO Regional Office for Science and Technology for Latin America and the Caribbean, Montevideo, Uruguay.
- Olsen, S.B., 1993. "Will Integrated Coastal Management Programmes Be Sustainable; the Constituency Problem." *Ocean and Coastal Management*, 21(1993):201-225. Elsevier Science Publishers Ltd., England.
- Organisation for Economic Co-operation and Development, 1993. *Coastal Zone Management: Integrated Policies*. OECD, Paris, France.
- Organization of American States and U.S. National Park Service, 1988. *Inventory of Caribbean Marine and Coastal Protected Areas*. Department of Regional Development, OAS and Office of International Affairs, NPS, Washington, DC.
- Pernetta, J. and D. Elder, 1993. *Cross-sectoral, Integrated Coastal Area Planning (CICAP): Guidelines and Principles for Coastal Area Development*. IUCN, Marine and Coastal Areas Programme.
- Price, A. and S. Humphrey, eds., 1993. *Application of the Biosphere Reserve Concept to Coastal Marine Areas*. Papers presented at the UNESCO/IUCN San Francisco Workshop of 14-20 August, 1989. A Marine Conservation and Development Report of IUCN. Gland, Switzerland.
- Price, A.R.G. and A.P. Heinenen, 1992. *Guidelines for Developing a Coastal Zone Management Plan for Belize*. A Marine Conservation and Development Report of IUCN. Gland Switzerland.
- Ray, G.C., et al., 1981. *Interim Guidelines for Identification and Selection of Coastal Biosphere Reserves*. A Report to the Directorate on Biosphere Reserves. U.S. MAB Report No. 6. U.S. Man and the Biosphere Programme, Department of State, Washington, DC
- Richards, W.J. and J.A. Bohnsack, 1990. "The Caribbean Sea: A Large Marine Ecosystem in Crisis." In: K. Sherman, L. Alexander and B. Gold, *Large Marine Ecosystems: Patterns, Processes and Yields*. American Association for the Advancement of Science.
- Rogers, C.S., 1985. "Toward A Lesser Antillean Biosphere Reserve." *Parks*, 10(3):22-24.
- Rogers, C.S., 1990. "Responses of Coral Reefs and Reef Organisms to Sedimentation." In: *Marine Ecology Progress Series*, 62:185-202.
- Rogers, C.S., et al., 1994. *Coral Reef Monitoring Manual for the Caribbean and Western Atlantic*. Virgin Islands National Park, St. John, Virgin Islands.
- St. Martin, K., ed., 1993. *Explorations In Geographic Information Systems Technology*. Volume 3. Applications in Coastal Zone Research and Management. United Nations Institute for Training and Research, Geneva, Switzerland.

- Salas, H.J., 1994. *Submarine Outfalls. General Overview, Basic Design Concepts and Data Requirements for Latin America and the Caribbean.* Prepared for UNEP's Second Meeting of Experts on Land-based Sources of Pollution in the Wider Caribbean Region, San Juan, Puerto Rico, 21-25 March 1994. UNEP(OCA)/CAR WG.14/INF.15.
- Salm, R.V., 1984. "Ecological Boundaries for Coral-reef Reserves: Principles and Guidelines." *Environmental Conservation*, 11(3):209-215.
- Snedaker, S.C. and C.D. Getter, 1985. *Coastal Resources Management Guidelines.* Renewable Resources Information Series, Coastal Management Publication No. 2. Prepared by Research Planning Institute, Inc., Columbia, SC for U.S. National Park Service and U.S. Agency for International Development.
- Sorensen, J., 1993. "The International Proliferation of Integrated Coastal Zone Management Efforts." *Ocean and Coastal Management*, 21(1993):45-80. Elsevier Science Publishers Ltd., England.
- Sorensen, J.C., S.T. McCreary, and M.J. Hershman, 1984. *Institutional Arrangements for Management of Coastal Resources.* Renewable Resources Information Series, Coastal Management Publication No. 1. Prepared by Research Planning Institute, Inc., Columbia, SC for U.S. National Park Service and U.S. Agency for International Development.
- Steel, J., 1993. *South Atlantic and Caribbean Regional Marine Research Plan.* North Carolina State University, Raleigh, NC, USA.
- Thia-Eng, C., 1993. "Essential Elements of Integrated Coastal Zone Management." *Ocean and Coastal Management*, 21(1993):81-108. Elsevier Science Publishers Ltd., England.
- Towle, E.L. and C.S. Rogers, 1989. *Case Study on the Virgin Islands Biosphere Reserve.* Contribution to the UNESCO/IUCN Workshop on the Application of the Biosphere Reserve Concept to Coastal Marine Areas, San Francisco, 14-20 August 1989. Island Resources Foundation Occasional Paper No. 50. St. Thomas, Virgin Islands.
- Towle, E.L. and R. Volk, 1994. *Case Study. From Theory to Practice with Virgin Islands Coastal Management: A Retrospective View.* Prepared for InterAmerican Development Bank's 5th Consultative Meeting on the Environment, "NGOs and the IDB -- A Focus on Participation", Bridgetown, Barbados, 31 May, 1994.
- United Nations Centre for Human Settlements (UNCHS) and United Nations Development Programme (UNDP), 1994. Programme for Environmentally Sustainable Land Use Planning and Settlements Development in the O.E.C.S. Bridgetown, Barbados.
- United Nations Department for Development Support and Management Services, 1993. *Integrated Macroeconomic Development Planning and Management for Sustainable Development Guidelines for Island Developing Countries.* United Nations, New York.
- United Nations Development Programme (UNDP), and Division for Ocean Affairs and the Law of the Sea (DOALOS), 1994. *Action Plan for Human Resources Development and Capacity Building for the Planning and Management of Coastal and Marine Areas, 1993-1997.* First Edition, March 1994.

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United Nations Education, Scientific and Cultural Organization (UNESCO), 1983. *Coastal Ecosystems of Latin America and the Caribbean*. Objectives, Priorities and Activities of UNESCO's COMAR Project for the Latin American and Caribbean Region, Caracas, Venezuela, 15-19 November 1982. UNESCO Reports in Marine Science No. 24.

United Nations Education, Scientific and Cultural Organization (UNESCO), 1994. *Island Agenda. An Overview of UNESCO's work on Island Environments, Territories and Societies*. Division of Ecological Sciences, UNESCO, Paris.

United Nations Environment Programme (UNEP), 1987. *Action Plan For The Caribbean Environment Programme. A Framework For Sustainable Development*. UNEP Caribbean Regional Co-ordinating Unit, Kingston, Jamaica.

United Nations Environment Programme (UNEP), 1989a. *Regional Overview of Environmental Problems and Priorities Affecting the Coastal and Marine Resources of the Wider Caribbean*. CEP Technical Report No. 2. UNEP Caribbean Environment Programme, Kingston, Jamaica.

United Nations Environment Programme (UNEP), 1989b. *Report of the Second Meeting of Experts for the Development of A Protocol Concerning Specially Protected Areas and Wildlife to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region*. Kingston, 19-23 June 1989. UNEP(OCA)/CAR WG.3/5.

United Nations Environment Programme (UNEP), 1991. *Action Plan for the Environment in Latin America and the Caribbean*. UNEP, Regional Office for Latin America and the Caribbean.

United Nations Environment Programme (UNEP), 1992a. *Environmental Quality Criteria for Coastal Zones in the Wider Caribbean Region*. CEP Technical Report No. 14. UNEP, Caribbean Environment Programme, Kingston, Jamaica.

United Nations Environment Programme (UNEP), 1992b. *Meeting of Experts on Land-Based Sources of Pollution, Veracruz, Mexico, 6-10 July 1992*. UNEP (OCA)/CAR WG.9/4.

United Nations Environment Programme (UNEP), 1992c. *Training in Land and Coastal Use Planning -- Case Study Venezuela*. CEP Technical Report No. 13. UNEP, Caribbean Environment Programme, Kingston, Jamaica.

United Nations Environment Programme (UNEP), 1993a. *Common Guidelines and Criteria to the Wider Caribbean Region for the Identification, Selection, Establishment, and Management of Protected Areas of National Interest*. UNEP (OCA)/CAR WG.11/6. Second Meeting of the Interim Scientific and Technical Advisory Committee (ISTAC) to the Protocol Concerning Specially Protected Areas and Wildlife in the Wider Caribbean Region (SPAW). French Guiana, 3-5 May 1993.

United Nations Environment Programme (UNEP), 1993b. *Guidelines for Integrated Management of Coastal and Marine Areas with Special Reference to the Mediterranean Basin*. UNEP, Mediterranean Action Plan, Priority Actions Programme, Ocean and Coastal Area Programme Activity Centre.

- United Nations Environment Programme (UNEP), 1993c. *Report on Interregional Meeting of Experts to Discuss Guidelines for Integrated Coastal and Marine Areas Management, Rome, 29 November-1 December, 1993*. UNEP, Mediterranean Action Plan, Priority Actions Programme, Regional Activity Centre, Rome.
- United Nations Environment Programme (UNEP), 1993d. *Status of Implementation of the Regional Programme on Specially Protected Areas and Wildlife (SPA/W)*. UNEP (OCA)/CAR WG.11/3. Second Meeting of the Interim Scientific and Technical Advisory Committee (ISTAC) to the Protocol Concerning Specially Protected Areas and Wildlife in the Wider Caribbean Region (SPA/W). French Guiana, 3-5 May 1993.
- United Nations Environment Programme (UNEP), 1994a. *Draft Recommendations on A Pollution Prevention, Reduction and Control Strategy for LBSMP in the Wider Caribbean Region*. Second Meeting of Experts on Land-Based Sources of Pollution in the Wider Caribbean Region, San Juan, 21-25 March, 1994. UNEP(OCA)/CAR WG.14/CRP.3.
- United Nations Environment Programme (UNEP), 1994b. *Regional Overview of Land-based Sources of Pollution in the Wider Caribbean Region (Revised Version)*. Second Meeting of Experts on Land-based Sources of Pollution in the Wider Caribbean Region, San Juan, Puerto Rico, 21-25 March 1994. UNEP(OCA)/CAR WG.14/4.
- United Nations Environment Programme/Economic Commission for Latin America and the Caribbean, 1984. *The State of Marine Pollution in the Wider Caribbean Region*. UNEP Regional Seas Reports and Studies No. 36. UNEP.
- United Nations Food and Agriculture Organization, 1991. *Living Marine Resources*. Research Paper No. 5 prepared for the United Nations Conference on Environment and Development.
- United Nations Office for Ocean Affairs and the Law of the Sea, 1990. *The Law of the Sea: Protection and Preservation of the Marine Environment*. Repertory of International Agreements Relating to Sections 5 and 6 of Part XII of the United Nations Convention on the Law of the Sea. New York.
- U.S. Agency for International Development and U.S. Department of Commerce/NOAA, 1987. *Caribbean Marine Resources: Opportunities for Economic Development and Management*. Washington, DC.
- U.S. Man and the Biosphere Programme, 1989. *Puerto Rico Workshop on Land-based Sources of Marine Pollution in the Wider Caribbean Region. August 7-9, 1989, San Juan, Puerto Rico*. Caribbean Islands Directorate, OES/ENR/MAB, Department of State, Washington, DC.
- U.S. National Research Council, 1994. *Environmental Science in the Coastal Zone: Issues for Further Research*. Proceedings of A Retreat held at the J. Erik Jonsson Woods Hole Center, Woods Hole, Massachusetts, June 25-26, 1992. National Academy Press, Washington, DC.
- Vallega, A., 1993. "A Conceptual Approach to Integrated Coastal Management." *Ocean and Coastal Management*, 21(1993):149-162. Elsevier Science Publishers Ltd., England.
- Vallejo, S.M., 1993. "The Integration of Coastal Zone Management into National Development Planning." *Ocean and Coastal Management*, 21(1993):163-182. Elsevier Science Publishers Ltd., England.

- 
- van der Weide, J., 1993. "A System View of Integrated Coastal Management." *Ocean and Coastal Management*, 21(1993):129-148. Elsevier Science Publishers Ltd., England.
- Vermeiren, J.C., 1989. *Natural Disasters: Linking Economics and the Environment with A Vengeance*. Paper prepared for Caribbean Conservation Association's Conference on Economics and the Environment, Barbados, November 6-9, 1989.
- Vermeiren, J.C. and C.C. Watson, Jr., 1994. *New Technology for Improved Storm Risk Assessment in the Caribbean*. OAS, Dept. of Regional Development and Environment, Washington, DC.
- Williams, M.C., 1988. "Coastal Zone Management Strategies: The Caribbean Experience." In: F. Edwards, ed., *Environmentally Sound Tourism in the Caribbean*. The Banff Centre, School of Management. University of Calgary Press.
- Willms & Shier, 1992. *Institutional Strengthening Project. Final Report - Stage 1*. Prepared for Coastal Conservation Project Unit, Ministry of Labour, Consumer Affairs and the Environment, Government of Barbados.
- World Bank, 1993. *Noordwijk Guidelines for Integrated Coastal Zone Management* (for distribution to the World Coast Conference 1993, Noordwijk, The Netherlands, 1-5 Nov., 1993). The World Bank, Environment Department, Land, Water and Natural Habitats Division, Washington, DC.
- World Bank, 1994. *Initiatives for Regional Action on Caribbean Environmental Issues*. Report No. 13045-LAC. Latin America and the Caribbean Region, The World Bank, Washington, DC.

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**ANNEX I**  
**GLOSSARY**

<i>Biodiversity</i>	Short for biological diversity, biodiversity refers to the variety and variability among living organisms and the communities in which they live. The most frequent measure of diversity is a list of the species occurring within an area, but the concept of diversity can also refer to the gene pool of a given species or to the habitats where that species occurs.
<i>Carrying Capacity</i>	The maximum number of users which can be sustained by a natural or man-made resource without endangering the character and quality of that resource at a sustained resource productivity over time.
<i>Coastal</i>	The sea-land interface or a place where land, water and air meet.
<i>Coastal Ecosystem</i>	An area that contains a set of characteristic physical, chemical and biological properties; examples include mangrove forests, intertidal mud flats, saline swamps, lagoons, coral reefs, and seagrass beds. Also used to refer to an assemblage of lesser ecosystems.
<i>Coastal Environment</i>	Natural and man-made conditions that are either specific to the coastal zone (e.g., estuaries) or whose attributes are significantly determined by its location where the land meets the sea and fresh water meets salt.
<i>Coastal Resources</i>	A natural area or feature in or near a coastal zone, the existence of which depends on the coast, or the value of that resource, treated as a commodity, grows because it is located in the coastal zone, if that resource has economic, environmental, recreational, cultural, aesthetic or any other value.
<i>Coastal Zone</i>	A geographically delineated area that is distinctively characterized by the aggregation of interacting coastal environments and corresponding natural and man-made structural systems. It is most frequently defined as land affected by its proximity to the sea and that part of the sea affected by its proximity to the land, or that area where the processes which depend on the sea-land interaction are the most intensive.
<i>Coastal Zone Landforms</i>	Including water bodies and landforms such as islands and reefs, continental coasts with barrier islands, beaches, cliffs, sand dunes, headlands and cliffs, peninsulas, offshore islands, lagoons, bays, estuaries, sounds and deltas.
<i>Coastal Zone Management (CZM)</i>	Essentially a "production function" that combines "inputs" (labor, natural resources, capital, time) to produce desired outputs, e.g., public beaches for recreation, navigation facilities, a specified level of water quality, mean annual fish harvests, the preservation of a marine sanctuary, or to reduce vulnerability to sea level rise and other potential impacts of climate change.
<i>Coastal Zone Management Plan</i>	Designed to be the basic guide that determines how coastal resources and environments should be allocated among the many competing interests of society by means of setting and establishing goals and measures.

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<i>Coastal Zone Management Program</i>	The core of such a program consists of the development stage for the CZM plan. Surrounding the core are a number of strategies that might include other aspects such as a public participation strategy and an applied research strategy.
<i>Common Property Resources</i>	Certain natural resources -- like pasture lands, forests, fisheries, wildlife, reefs, beaches -- are considered to be common property resources, that is, ownership of the resource is held in common so that the resources can be shared and jointly used.
<i>Ecosystem</i>	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit in a given area such as wetland communities, estuaries, and savannahs. They form the core organizational structures of the natural world. Ecosystems have a degree of inherent stability which helps them to resist some disruption. Significant man-made stressors, however can alter ecosystems, affecting their ability to sustain life, including human life.
<i>Ecosystem Approach</i>	An analytical management approach which seeks to consider explicitly the physical, chemical and biological interactions among the various components of the system in relation to natural and anthropogenic inputs to the system, and natural and anthropogenic withdrawals and outflows from the system.
<i>Estuary</i>	Unique waterways where fresh water drained from the land mixes with salt water from the ocean. This blend of salt and fresh water makes estuaries biologically productive, sustaining certain finfish, shellfish, marshes, underwater grasses, and microscopic marine life. Because of their economic, aesthetic and recreational value, estuaries are increasingly attracting both people and commerce to their shores.
<i>Externality</i>	This occurs when some of the benefits or some of the costs of an action are external to the decision-maker's analysis, so that the welfare of one individual is influenced by an activity under the control of another, i.e., some of the benefits go to, or some of the costs are imposed upon, individuals who had no part to play in the decision.
<i>Geographic Information System</i>	Computer systems for the storage, analysis, and display of geographic information.
<i>Greenhouse Effect</i>	The theory that continued burning of fossil fuels will increase concentrations of carbon dioxide in the atmosphere, thereby trapping additional heat and moisture. In time, this could create a hothouse effect, raising the temperature of the earth, causing glaciers to melt and the sea level to rise.
<i>Habitat</i>	The sum total of environmental conditions of a specific place that is occupied by an organism, a population, or a community.
<i>Hazardous Waste</i>	A subset of solid waste which can create a risk to the safety or health of people or the environment. Any solid waste which is ignitable, corrosive, reactive or toxic and which may pose a substantial or potential hazard to human health and safety, or to the environment when improperly managed.

<i>Governance</i>	The composite of laws, customs and organizations and management strategies established by society to allocate scarce resources and competing values for a social purpose, such as to manage a nation's coastal resources and environment.
<i>Integrated Coastal Zone Management (ICZM)</i>	A dynamic process in which a coordinated strategy is developed and implemented for the allocation of environmental, socio-cultural and institutional resources to achieve the conservation and sustainable multiple use of the coastal zone.
<i>Integrated Management</i>	At the operation level, integrated management refers to the coordination, among all the responsible agencies, of the tasks necessary to plan and implement activities -- like CZM activities -- including the acquisition and allocation of resources on which they depend.
<i>Management Arrangements</i>	The totality of institutional arrangements and management instruments available to policy and decision makers and managers in the development and implementation of a management program.
<i>Management Instruments</i>	Consisting of structural and regulatory measures that enable managers to achieve the goals and objectives articulated in the management plan. Structural measures involve hard and soft structures and, when relevant, corresponding rules of operation. Regulatory instruments are measures to induce users of the coastal resources to a desired behavior. Such measures are established by law or other forms of "authority", such as government decrees or social traditions.
<i>Management Strategies</i>	Part of a management plan related to specific possible actions with respect to the application of management instruments.
<i>Non-point Source Pollution</i>	Pollutants emanating from an unconfined or unchanneled source, including agricultural runoff, drainage or seepage, and air contamination from landfills or surface impoundments.
<i>Planning</i>	The formulation, analysis, evaluation and adoption (selection) of a preferred set of implementation measures (strategy), and the corresponding specification of clear verifiable goals to be achieved.
<i>Point Source</i>	Any pollution from a confined and discrete conveyance such as a pipe, ditch, channel tunnel, well, fissure, container, rolling stock, concentrated animal-feeding operation, or vessel or other floating craft.
<i>Pollution Charges</i>	Includes <i>effluence charges</i> (based on the quantity and/or quality of discharged pollutants), <i>product charges</i> (charges laid upon the price of products which are polluting in the manufacturing or consumption phases or for which a disposal system has been organized), <i>user charges</i> , <i>administrative charges</i> (e.g., control and authorization fees), <i>tax differentiation</i> .

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<i>Resource Management</i>	A conscious process of decision-making whereby natural and cultural resources are allocated over time and space to optimize the attainment of stated objectives of a society, within the framework of its technology, political and social institutions, and legal and administrative arrangements.
<i>Runoff</i>	Water which, having fallen, flows across the surface of the ground picking up materials such as soil, agricultural chemicals and other transportable materials, continuing into a watercourse.
<i>Sedimentation</i>	The accumulation of earthly matter (soil and mineral particles) washed into a river or other water body (normally by erosion) which settles on the bottom.
<i>Stakeholders</i>	Individuals, organizations, or groups with vested interests in the allocation of the resources of the coastal zone.
<i>Sustainable Development</i>	A relatively new paradigm or mode of thinking that serves as a guide to action. It entails a <i>continuous process of decision-making</i> in which certain questions are asked and choices and decisions are made which aim at meeting the needs of the present without compromising the ability of future generations to meet their own needs. There is never an "end-state" of sustainable development since the equilibrium between development and environmental protection must constantly be readjusted.
<i>Sustainable Resource Use</i>	Exploitation of a resource so that it is not harvested, extracted or utilized in excess of the amount which can be regenerated. The resource is seen as a capital investment with an annual yield; it is the <i>yield</i> that is utilized and not the capital investment which is the resource base.
<i>Water Dependent</i>	A water dependent use or activity cannot exist in any other location and is dependent on a water location by reason of the intrinsic nature of its operation. The water location or access must be needed for water-borne transportation, public access, or source of water.
<i>Water Related</i>	A water related use or activity is not intrinsically dependent on a waterfront location. A use or activity is water related if: <ul style="list-style-type: none"> <li>o It provides goods or services that are directly associated with water dependent uses, such as supplying materials or services or using products of water dependent uses; or</li> <li>o It gains substantial cost savings or revenue-differential advantages (not associated with land cost or rents) from being located on the waterfront that it could not obtain from an inland location; or</li> <li>o A location other than adjacent to the water would result in public loss of quality in the goods and services offered, considering the economic, social and environmental consequences of the use.</li> </ul>
<i>Wetlands</i>	Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

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## ANNEX II

### INTEGRATED COASTAL AREA MANAGEMENT IN THE WIDER CARIBBEAN

#### A Training Programme *Check List* for Coastal Resource Management Professionals

#### I. INTRODUCTION

An increasing number of institutions, some with more experience than others, are offering courses and workshops purporting to provide professional and technical training in the subject matter of coastal area resource planning and management. A few give evidence of appreciating the complexities of integrated coastal management and the diverse skills required in what is a truly intersectorial, interdisciplinary field. This checklist is not a course curriculum (although it could be adapted as such); it is more an inventory of the topical issues and conceptual tools and skills that ideally need to be presented to any serious student of the subject.

#### II. THE TRAINING PROGRAMME: PREFERRED APPROACHES

- use of in-country personnel
- needs assessment and tailoring the training programme for individual/country needs
- high interactive, problem-solving approach
- field work
- case-study/classroom work
- visual aids
- self-contained modules
- community participation

#### III. TRAINING MODULES

##### A. The Coastal Ecosystem

1. Oceanographic Environment
  - a. Geochemical
  - b. Hydrological
  - c. Estuarine interactions
2. Biological Environment
  - a. Terrestrial
  - b. Marine
3. Human Environment
  - a. Population parameters
  - b. Economy/environment interactions
  - c. Issues of sustainability
  - d. Institutional options and constraints

- B. Planning and Development Control in the Coastal Zone
  - 1. Policy/legal/institutional framework
    - a. Taxation policy
    - b. Sectorial policies
    - c. Organizational
  - 2. Resource use planning primer
    - a. Land use capability analysis/trends
    - b. Water use planning
    - c. Photo interpretation and mapping
  - 3. Development control mechanisms
    - a. Zoning
    - b. Environmental permitting
      - i. Review and assessment of country planning, permitting system, institutional arrangements
      - ii. Command-and-control regulation
      - iii. Participatory/community-based approaches
  - 4. Site plans: design and review
  - 5. Environmental impact assessment
  - 6. Impact mitigation
  - 7. Special topics
    - a. watershed management
    - b. Steep-slope development
    - c. Erosion/sediment control (BMPs)
    - d. On-site sewage treatment systems
    - e. On-site potable water systems
    - f. On-site power generation
    - g. Underground/above ground storage tanks
    - h. Shoreline setbacks, erosion control, sand mining
    - i. Dredging
    - j. Marina planning
    - k. Other land-based sources of marine pollution
  - 8. Inspection and enforcement
- C. Biodiversity Conservation/Parks and Protected Areas
  - 1. Importance of maintaining biodiversity
  - 2. Inventory techniques
  - 3. Conservation area planning
  - 4. Implementation strategies
  - 5. Complementary objectives: park system planning
  - 6. Wildlife management
  - 7. Fisheries management
  - 8. Protected area planning for historic/cultural sites in the coastal zone
- D. Wetlands Management
  - 1. Definition and components of a wetland ecosystem
    - a. Hydrology
    - b. Hydric soils
    - c. Hydrophytic vegetation
    - d. Mangrove/seagrass/coral reef interactions
  - 2. Inventory techniques
  - 3. Developing a management framework

4. Implementation strategies
    - a. Policy framework
    - b. Legislative framework
    - c. Technical needs
    - d. Development control framework
  5. Monitoring techniques
- E. Water Quality Monitoring and Assessment
1. Goals: maintaining designated use
  2. Water quality standards
  3. Parameters
  4. Monitoring techniques
- F. ACHIEVING SUSTAINABILITY
1. Natural Hazard Mitigation
    - a. Landslide hazard mitigation
    - b. Coastal storm hazard mitigation
    - c. Floodplain management
  2. Pre-/post-disaster assessment
  3. Long-term ecological monitoring
    - a. Coral reefs
    - b. Seagrass
    - c. Mangroves
    - d. Salt ponds, wetlands, estuaries
    - e. EEZs
    - f. Watersheds
    - g. Beaches and dunes
  4. Conflict resolution/co-management
  5. Information systems management
    - a. GIS
    - b. Cartographic capability
    - c. Library/documentation systems
    - d. Information exchange
  6. Solid waste/landfill management
    - a. Design, construction, operation, closure
    - b. Site assessment/selection
    - c. Waste stream minimization
    - d. Recycling
  7. Programme evaluation

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Source: Prepared by Richard Volk, Senior Coastal Planner, Islands Resources Foundation, 1993.