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REVIEW DRAFT

PROGRAM DEVELOPMENT FOR MANAGEMENT OF COASTAL RESOURCES

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and Atmospheric Sciences
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Prepared by

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for

National Park Service
U.S. Department of the Interior

and

U.S. Agency for International Development

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FOREWORD

In a world of rapid population growth and diminishing natural resources, countries that fail to plan their economic development strategy together with resource conservation and environmental management may not be able to sustain progress in health, food, housing, energy, and other critical national needs. Each developing country needs to have a realistic plan for accommodating its share of the 100 million people per year being added to the world's population. Such basic resources as fuel, water, fertile land, and fish stocks are already in short supply in many countries and their future prospects are in grave doubt. Conservation is particularly important for the coastal zones of the maritime countries. Coastal zones provide important sources of protein food, tourist income, mangrove forest products, and other, economic goods and services.

Most countries recognize their coastal zones as distinct regions with resources that require special attention. Many of them have taken specific actions to conserve coastal resources and to manage coastal development. A few countries have created centralized coastal zone management programs that are integrated with other economic sector and resource conservation programs. There is a current trend to move toward more comprehensive coastal programs, which in this book the authors term "Coastal Area Management and Planning (CAMP) programs" as a generic description.

An effective CAMP program can be the major force in any country for resolving conflicts over the use of coastal resources and for guaranteeing the long term economic sustainability of the coastal resource base. The past history of coastal occupancy and coastal development throughout the world shows a clear pattern of unnecessary waste and depletion of coastal resources. With the knowledge now accumulated and the techniques created for coastal area management, this trend can, and should be, reversed. With appropriate guidance through CAMP, coastal communities can both invigorate their economies and conserve their natural resources for long term highest sustainable yield.

While the presence of a CAMP-type integrated planning and comprehensive management alone may not assure a sustained and ample yield from the coastal natural resources of any country, its absence will lead to their depletion. Very rarely will long term economic benefits occur from development based on excessive exploitation of coastal resources. Better economic returns will come from development closely linked to resource conservation. In the coastal zone, the need for such an enlightened approach is urgent.

It should also be noted that other important issues can be incorporated in a CAMP-type program. For example, natural hazards that jeopardize life and property in coastal areas, such as cyclonic seastorms, may be addressed through both the planning and management elements of CAMP. One planning approach is to direct all new coastal development away from hazard zones; one management approach is to require modification of development permits that do not conform to standards of safety.

This book is addressed mainly to the need for improved planning for coastal development and conservation. It presents in as simple a form as possible, the process and procedures for Coastal Area Management and Planning (CAMP). The CAMP process is holistic, integrative and is the coastal counterpart of such areawide systems as River Basin Management and Regional Economic Development Planning.

The present book is one in a series of publications being produced for the Agency for International Development (AID) by the National Park Service (NPS), Office of International Affairs. It was prepared in cooperation with the University of Miami and is meant to provide structure and unity for the whole series. The purpose of the series is to provide expert guidance in planning and management for sustainable coastal development and for the conservation of coastal resources. In addition to this book on CAMP program development, the coastal series includes: a report on institutional arrangements for coastal resources management (No.1), a coastal development guidebook (No.2), and a casebook of coastal development studies (No.3).

This coastal series is part of a wider publication and training partnership between AID and NPS under the "Natural Resources Expanded Information Base" project commenced in 1980 in response to a worldwide need for improved approaches to integrated regional planning and project design. The project is producing publications on arid and semi-arid rangelands and humid tropic systems as well as on coastal zones. The publications and training components are dedicated to strengthening the technical and institutional capabilities of developing countries in natural resources and environmental protection as well as to providing international development assistance agencies with ready access to practical information.

Hugh Bell Muller and Jeffrey Tschirley directed the implementation of the "Expanded Information Base" project for NPS and John Clark managed all the coastal components, as well as authoring this volume while employed by NPS and more recently by the University of Miami, Rosenstiel School of Marine and Atmospheric Sciences. We thank AID for sponsoring the project. We are specially grateful to Mr. Jack Sullivan, Ms. Molly Kux, Mr. Random DuBois, and Ms. Nora Berwick of the Office of Forestry,

Environment and Natural Resources of the Bureau of Science and Technology, for their continuing encouragement and support.

Robert C. Milne
Chief, Office of International Affairs
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PREFACE

The seacoast is distinct. It follows that public action to conserve its resources must be distinctive. That is why many countries are now working out special integrated "Coastal Area Management and Planning" (CAMP) strategies, and why some have already begun to adopt CAMP-type programs. An effective CAMP program can be the major force in any country for resolving conflicting demands over the use of resources and for guaranteeing the long term economic sustainability of the coastal resource base. CAMP is a system of development management that is coordinated with resources management, or conservation.

The coastal area, or coastal zone, is defined by Sorenson et al (75) as "...the interface or transition...that part of the land affected by its proximity to the sea and that part of the ocean affected by its proximity to the land...an area in which processes depending on the interaction between land and sea are most intense." But it must be noted that the border between land and sea is never fixed -- it changes daily with the tides, monthly with the moon stages, seasonally with astronomic forces, and sporadically with seastorms and great river floods. It is also a place of natural dynamism where huge amounts of energy are released and a great abundance of life is nurtured. It is also a place of high priority interest to people, to commerce, to the military, and to a variety of industries. In all but the larger coastal settlements, the coastal location creates distinctively maritime cultures.

Unfortunately, the past history of coastal occupancy and coastal development throughout the world shows a pattern of wasteful depletion of coastal resources, waste that is not a necessary consequence of economic progress. With the knowledge now accumulated and the techniques that have been created for coastal area management, this trend can and should be reversed. With appropriate guidance through CAMP, coastal communities can both maintain long term economic growth and conserve their natural resources for highest sustainable yields. But to do this, the CAMP program has to involve both resources management and development management and it has to integrate the concerns of all relevant sections of society and the economy. It is most important that coastal economic development be generated for the people of a country not for the already rich and powerful.

The test of any proposed use of coastal resources is whether the use is sustainable; that is, whether the resource can permanently sustain the proposed level of use. The test of any development not based upon renewable resources is whether or not its impacts upon resources and the human environment cause a long term loss -- rather than a gain -- in social and economic conditions. Also, the development of each region should be

planned to accomplish the maximum of multiple use opportunity; that is, development planning should ensure that fisheries, manufacturing, tourism, habitat protection, housing, shipping, and so forth, all can prosper by creating the optimum mix of economic activity.

In the future, more government intervention in coastal development and resource conservation will be needed because of: the growth in coastal populations and the social needs that will arise; increasing pressure on the coast to supply seafood, tourism revenue, and other needs; and the intense competition and conflicts that come with coastal area crowding. There is also the problem that coastal waters are a "commons" in most countries-- "By the law of nature these things are common to mankind -- the air, running water, the sea and consequently the shores of the sea" (Institutes of Justinian 2.1.1) (54). The commons can only be managed by government intervention, even where that intervention is aimed at protecting traditional uses of the coast.

CAMP establishes a process whereby government intervention can be organized, informed, and effective. Most descriptions of the CAMP process have given inadequate attention to planning as distinguished from management. The term "Coastal Area Management and Planning" (CAMP) which we use here is intended to highlight the importance of the planning function which the author believes to be as important as, or more important than, the management function for most tropical coastal countries. CAMP is intended to be a generic term for the process. As such, it includes "Coastal Zone Management", "Coastal Resources Management", and all other terms for integrated approaches to management and/or planning for simultaneous consideration of development and its effects on resources conservation along the seacoast.

A CAMP-type program is the ideal approach to management and planning of coastal development and resource conservation. It is also complex in concept and complicated to implement in its totality, as described in this book. But this is because the problems that CAMP addresses are very complex. Many countries will find it feasible and desirable to create a simplified version of the full CAMP program, at least in the beginning. How this can be done will be obvious from an examination of the recommended program structure in Chapter 5.

Development and conservation can co-exist, indeed they must co-exist, if today's societies are to prosper in coming years. First, conservation is necessary to adjust the pressure on the resources so that they are not overexploited. Second, control of coastal development is necessary to protect resources from gross pollution and flagrant destruction of essential habitats. Both needs must be met if we are to have resources for the future. The technology by which to guarantee sustainability of coastal

resources exists as well as the methodology for its application, which is the subject of this book.

No modern society can for long put off the task of conserving its coastal resources. These resources are too valuable to squander needlessly. We know, and accept, that some loss of fishery production must accompany coastal development such as -- harbors, cities, mining, agriculture, even dams -- and we know that each fisherman's share of the catch must decrease as more boats and nets join the fleet. But runaway depletion should be not acceptable and is not necessary. We must not let the future go awry because of our indifference today.

This book is organized to present, in its various sections, the conceptual framework for CAMP and enough details and examples for any country to evaluate the approach and decide whether it has promise for solving coastal problems. It goes from basic principles through approaches to program development. As such the book is more a policy guide than a CAMP manual. The reader should note that the book uses a numeric citation system; that is each reference is identified by a number within parentheses. For example, (18) indicates the 18th item in the "References" section at the end of the book.

John R. Clark
Miami, Florida
September, 1988

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CHAPTER 1. BACKGROUND

1.1 Beginnings

In the United States the first comprehensive coastal zone management (CZM) program was initiated in October 1972, under the Coastal Zone Management Act; implementation was delegated to the Department of Commerce. The purpose of the CZM Act was to provide incentive for each of the U.S. coastal states to conserve its coastal resources by offering Federal funds and guidance. In addition, the Federal office in Washington, D. C. was mandated to ensure Federal consistency with the state programs, to provide technical assistance, to set up and operate protected baseline "Estuarine Reserves" for research purposes, and to provide policy liaison with other Federal agencies. This program appears to be a legislative success and to have accomplished coastal conservation to the maximum extent that is politically possible. The United States CZM program serves as one model of a state-operated, permit-based national CAMP program, with a focus on control of the use of private land.

While the United States CZM program is centrally funded, it is operated by the individual states, each with their own unique program. At the national level, it requires the cooperation of numerous Federal agencies and active coordination among agencies. One reason for the focus at the state level is that strong Federal participation in coastal matters is provided for under many other national laws and programs. A model that would be more appropriate for most countries is one with more direct control and influence by the central government. The object is to ensure coordination of all relevant economic and administrative sectors toward a common purpose of achieving planned coastal development and conservation of coastal renewable resources, as explained throughout this book.

1.2 Characteristics of CAMP Programs

Coastal Area Management and Planning (CAMP) is a distinct conservation process set up for coastal areas in order to achieve sustainable use of important natural resources. In its planning mode, CAMP examines the consequences of various development actions and proposes necessary safeguards, constraints, and development alternatives that will guarantee sustainable development and the sustainable use of coastal natural resources, at the most productive levels possible. In its management mode, CAMP fulfills the planning mandate by assessing conservation impacts of specific project proposals and by recommending changes necessary to conserve resources. CAMP coordinates actions of various economic sectors to ensure that advances in one sector do not bring reverses in another; for example, that port development does not unnecessarily diminish local fisheries or tourism.

Box 1.1

Coastal Resource Issues Listed by US/AID

1. Loss of mangrove forests due to rate of exploitation above that which would sustain the resource.

2. Coral reef destruction leading to reduced yield of fish species associated with reefs; reduced tourism attraction; and loss of rare ecosystems due to:

-dynamiting to harvest fish from the reef,
-harvesting of coral for construction material or, in the case of exotic coral species, for jewelry or souvenirs,
-siltation and smothering of coral from erosion associated with upstream deforestation, and
-death of coral from deleterious effluents associated with mining or oil spills.

3. Congestion and intensive use of coastal resources such as water, species, and fisheries, due to high population density and continuing growth, expansion of tourism industry, and growth of commercial and industrial activity.

4. Inadequate institutional structures to address coastal resource problems and to administer planning, management, regulation , and enforcement where it is needed.

5. Depletion of wildlife species such as turtles, crocodiles, deer, waterfowl, and manatees.

6. Pollution of coastal waters which adversely affects fisheries yield and tourism revenues due to:

-industrial wastes,
-sewage,
-agricultural pesticide run-off,
-oil spills,
-bilge discharges, and
-toxic contamination of fish/shellfish.

7. Beach and coastline erosion caused by removal of coastal mangrove forests; construction of coastal installations which alter current and wave action patterns; or mining of beaches for sand.

8. Swampland filling that reduces fish spawning and "nursery" habitat and reduces fisheries yields.

9. Upland deforestation leading to erosion and sedimentation.

10. Overfishing leading to reduced fisheries yield and in some cases species extinction.

11. Salt water intrusion leading to loss of coastal agricultural lands and potable water supplies.

Source: Reference No. 82

CAMP addresses national concerns for the coastal waters and natural habitats (e.g. coral reefs and seagrass meadows), the adjacent shorelands, and the transitional areas such as floodlands and intertidal areas (beaches, mangrove forests, etc.) that lie between the permanent waters and the shorelands. It provides a method to resolve problems of interaction between coastal lands and coastal waters in much the same way as river basin planning provides a method for resolving problems of interaction of valley lands and river waters. The CAMP process allows great flexibility, within its general framework, for application to widely different coastal circumstances. It can concentrate on the hazards of costal erosion, as in Sri Lanka's CAMP program (1); on fisheries as in the emerging Philippines CAMP program (56); on coastal and marine protected areas, as in the proposed Saudi Arabia CAMP strategy (23); on shrimp aquaculture as in Ecuador (74,49); or on land use, as in the United States program previously discussed. The type of issues that the CAMP system addresses are shown in Box 1.1 The scope of concerns is shown in Figure 1.1 (legend in Box 1.2).

CAMP is a generic term that includes all forms of comprehensive, integrated, coastal management. Therefore, CAMP is similar, but not analogous to CZM (Coastal Zone Management) and CRM (Coastal Resources Management). CZM in the United States is most specifically a state-operated permit program focused on management of uses of private shorelands. CRM usually addresses problems of common property (publicly owned) resources but is not necessarily sectorally integrated. The CAMP concept, however, addresses all resources in a defined coastal area (or zone) and integrates the interests of a variety of economic sectors. Also, CAMP incorporates coastal and marine parks and protected areas which CZM usually does not. CAMP-type programs, while distinctive in purpose and rooted in standard approaches, such as, regional development planning or river basin or watershed management.

The novelty of full-scale CAMP-type programs is that they are centrally controlled and apply integrated, area wide, resources planning and management to the distinct landforms and waters of the coast, where special knowledge, techniques, and governmental interactions are involved. CAMP focuses on shore development and habitats and environmental conditions, leaving fisheries management to other programs.

1.3 Benefits of CAMP Programs

Countries that depend on coastal resources to earn essential foreign exchange or to meet critical domestic needs should give serious thought to the potential of CAMP programs. Sorenson *et al*. (75) show that major incentives for coastal programs are: 1),

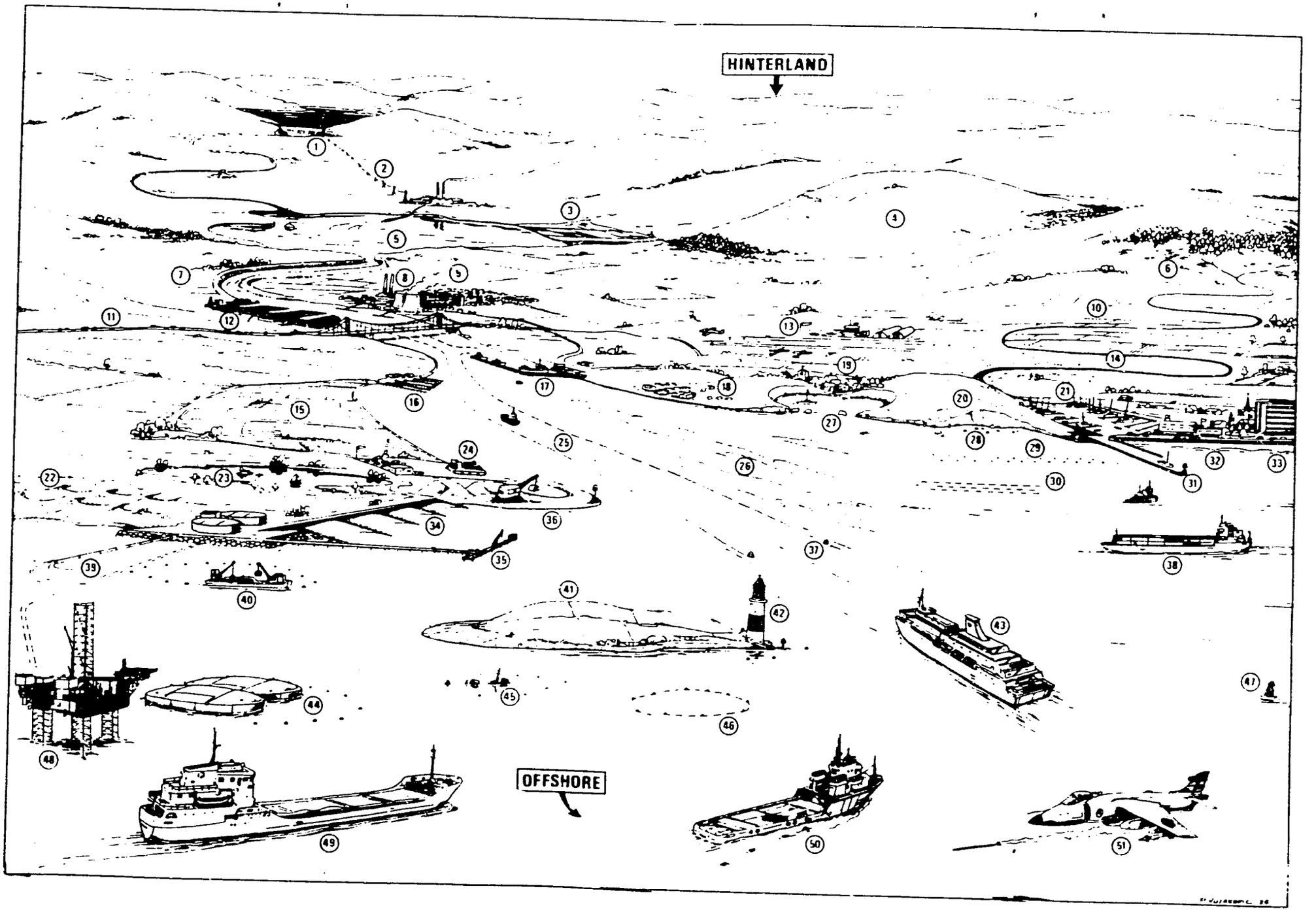

Figure 1.1. The coastal area and activities that cause resource use conflicts (Source: from ref. 44, with permission of I.P. Joliffe and C.R. Patman (authors) and Elsevier Applied Science Publishers Ltd. (publisher). See Box 1.2 for legend.

Box 1.2

Legend for Figure 1.1

The coastal zone: some of its principal elements. 1), Upstream dam or barrage; 2), Power line; 3), Lacustrine reclamation; 4), National park/countryside conservation; 5), Effluent discharge; 6), Deforestation; 7), Flood-liable area; 8), Coastal industry/power stations; 9), Estuarine urbanization; 10), Drainage/irrigation; 11), Transport links; 12), Redundant docks; 13), Coastal airport; 14), Wetland conservation/nature reserve; 15), Estuarine reclamation; 16), Mariculture; 17), Fishing harbour; 18), Caravan park; 19), Coastal settlement; 20), Eroding cliff; 21), Marina; 22), Dune conservation area; 23), Inland water body, e.g. flooded gravel pit; 24), Hoverport; 25), Dredged approach channel; 26), Sand banks; 27), Multiple water space use; 28), Scientific interest; 29), Buoys, e.g. water skiing; 30), Artificial reef, e.g. fishing; 31), Marine breakwaters; 32), Artificial beach; 33), Hotel/apartment development; 34), Groin field; 35), Bulk tanker terminal; 36), Beach mining; 37), Buoys; 38), Coastal trade; 39), Long-sea outfall; 40), Aggregate extraction; 41), Artificial island; 42), Lighthouse; 43), Cross-channel ferries; 44), Floating or submerged storage tanks; 45), Shipwreck; 46), Spoil dumping; 47), Offshore navigation; 48), Offshore oil/gas rig and undersea pipelines; 49), International sea trade; 50), Dumping of toxic wastes; 51), Military activities, e.g. air-to-sea firing range.

Source: Reference No.44

to enhance fisheries or tourism; 2), improve management of mangrove forests; or 3), protect life and property from natural hazards (including storms and shore erosion).

There is growing benefit from the CAMP approach in relation to development projects funded from "outside" agencies such as multilateral donors or international or regional development banks. This is because both the donors and banks are requiring more intense scrutiny of the conservation and environmental consequences of development projects as well as social and long term economic effects. The simple "benefit vs. cost" financial approach in monetary terms alone is becoming less useful as time goes on. Because CAMP is an integrative and broad planning process, it should more than satisfy the needs of international banks and donors for multi-sectoral assessments and programmatic impact analyses.

1.4 Creation of the CAMP Program

In operation, CAMP can be as simple as a system of mandatory environmental impact assessment of development projects. Or it can be as complex as a comprehensive, nationwide, fully integrated, coastal planning and management program.

Most countries will find that it is appropriate to fit their CAMP program into the current governmental structure in a manner that causes the least disruption of present institutional alignments. The political priorities of most countries are such that a new agency with strong powers that would preempt the authority of existing agencies would not usually be formed for CAMP. The CAMP entity will more likely serve in a planning, advisory, and coordinative role within the existing institutional structure, perhaps deriving most its clout through environmental (resource) impact assessment and costal project guidelines. Often it will be desirable to locate the CAMP office within an agency that already has appropriate regulatory powers, such as a natural resources, fishery, or environmental ministry.

The CAMP program must begin with a clear definition of policy by government, whether legislative or executive, and a clear commitment to follow through (see Chapter 4). There must be a specific CAMP policy giving direction to ministries and informing the private sector and international donors of the national intention to control coastal development and conserve coastal resources. Otherwise, all good intentions and all money spent on studies may come to naught.

CHAPTER 2. COASTAL RESOURCE SYSTEMS

2.1 Introduction

The natural resources of coastal areas are so different from their terrestrial counterparts as to require different and special forms of conservation. For example coral reefs, beaches, coastal lagoons, submerged seagrass meadows, and intertidal mangrove forests have no counterparts in terrestrial resources. Threats to the productivity of these unique resource systems arise from development activities and their side effects, such as reef and beach mining, shoreline filling, and marine construction, lagoon pollution, and sedimentation, and other activities that are distinct from those on land (see Box 1.1). Because the special conditions of the coast have not always been understood and given due regard by development organizations, program designers, economic planners, and project engineers, there have been losses of revenue, jobs, food, and foreign exchange earnings potential in many coastal countries that could have been avoided.

2.2 Conservation Problems

A major global problem is the widespread depletion of seafood resources caused by coastal pollution and critical habitat destruction along with overfishing. Lester R. Brown (10) gives the following statistics on fisheries: "Their annual harvest -- 74 million tons in 1983 -- exceeds world beef production by a substantial margin.. fisheries supply 23 percent of all animal protein consumed..In many low-income countries, as well as in a few industrial ones, fish are the principal source of animal protein..millions of people make their living from supplying fish.." In a time of rapid population increase, it is necessary to conserve the productivity of coastal habitats for fisheries, the same as we protect rangelands for livestock, farmlands for crops, and forest lands for wood. A summary of conservation problems affecting coastal resources is given in Appendix Table 1.

An example of coastal resources trouble brewing is the Philippines, where according to a recent study (51): "Per capita fish consumption decreased 47 percent from 1970 to 1980..prices seem to be moving upward..many believe a nutritional crisis of serious proportions is emerging." The World Resources Institute (51) warns· "The outlook for marine fisheries is not bright. The factors that have caused recent problems -- limited resources and excessive exploitation -- are likely to continue." In this book, the focus is on habitat management -- e.g protection of mangroves and coral reefs -- to maintain the resource potential of fisheries at its highest level. Harvest control to prevent over exploitation is not treated here because harvest management

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(controls on catch, seasons, areas, gear types, etc.) is not a typical CAMP subject. The CAMP role is to protect habitats and environmental quality along with management of development.

In the face of growing pressures on coastal resources it is essential to conserve fish habitats. Mangrove forests are one of the most important habitats and sources of nutrition for fish. Therefore, the widespread depletion of the 24 million hectares of coastal mangrove forest of the tropical world is a troubling example of shrinking habitat. The causes of depletion are shown in Table 2.1. While mangrove forests provide life support and income for millions of people, few countries have created effective mangrove conservation programs. Where laws have been passed, enforcement is often lacking. The lack of an overall national conservation policy and a CAMP-type program for the coast weakens the potential for enforcement of laws and regulations.

We must recognize that it is becoming more and more difficult to conserve any one particular resource in the absence of a comprehensive, integrated framework for policy, planning and management. For example, in Ecuador, shrimp aquaculture became so successful that up to half the mangroves in certain regions were replaced with shrimp ponds (21,62,74,49) with the result that by 1986 the remaining natural mangrove stands were unable to produce sufficient larval "seed shrimp" to stock the ponds and 60 percent of them lay idle (62). No CAMP program or other conservation policy or program was in effect to guide the industry, which has produced up to 44 percent of Ecuador's foreign exchange earnings (in 1982) and provided more than 90,000 jobs. No mechanism existed for cooperation among forest, aquaculture, fisheries, economic planning and other key sectors. In such a situation short term enterprise was free to flourish to the detriment of the long term economy of the country. Heavy borrowing of foreign capital for ponds and facilities contributed to Ecuador's recent serious foreign debt dilemma.

In another example, large-scale coral mining enterprises in southern Sri Lanka in the 1960's and 1970's left the shoreline exposed to erosion and storm surges, causing serious loss of beach and shoreland and exposure of the coast to storm surges. Sri Lanka reacted by enacting a CAMP program in 1982, with first emphasis on controlling coral mining to protect the shoreline and a later emphasis on natural resources conservation (1). The full program is expected to be in operation by 1989. Even though the original problem was localized to one region and specific to one issue, a national CAMP format was set up as the best way to deal with it; later the same format was ideal for broadening the program to other issues and to the coastline as a whole (81,2).

The Sri Lanka experience illustrates how coastal resources protect life and property from damage by natural hazards, such as

Table 2.1. Major causes of recent degradation of mangrove ecosystems by region. (Source: N.L. Berwick et al. in Table 9.5 of "World Resources 1986", ref. no. 84)

	Indo-Pacific	South Asia	Southeast Asia	Africa	Central America	South America	Wider Caribbean
Clear-cutting	+	+	+	+	+	+	+
Firewood	+	+	+	+	+	+	+
Freshwater Diversion		+		+			
Land Reclamation:							
Agriculture	+	+	+	+			+
Aquaculture		+	+	+	+	+	+
Development:							
Urban	+	+	+	+		+	+
Industry	+		+	+			
Ports	+	+	+	+		+	+
Siltation from Land Runoff	+			+			
Mining	+		+				
Solar Salt	+	+		+	+		+
Pollutants:							
Chemical	+		+	+			+
Domestic	+		+	+			+
Oil	+		+				+
Tourism/Recreation	+			+			+

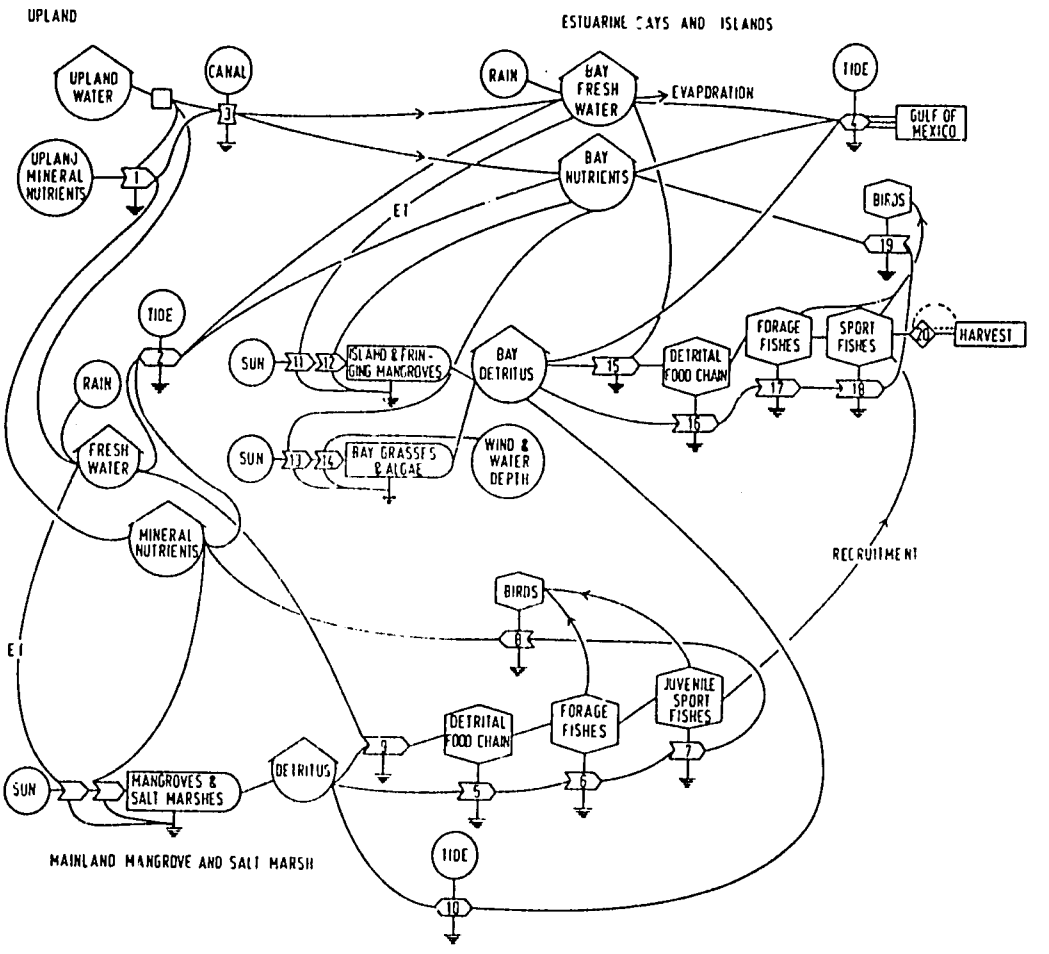


Figure 2.1. An example coastal ecosystem model showing linkages of upland, wetland, and bay and island components (Source: ref. no. 19)

sea storms. In fact, hazards loss reduction should begin with preservation of coastal landforms that provide natural resistance to wave attack, flooding, and erosion from hurricanes and storms. For example, dunes, beaches and wetlands protect coastal inhabitants and property against moderate storms and absorb some of the more violent energy of major storms. Human activities that remove or degrade protective landforms -- for instance, by removing beach sand, weakening coral reefs, bulldozing dunes, or destroying mangrove swamps -- may diminish the degree of natural protection that the coast receives.

Much of the damage to marine habitat continues because the damage to them is not usually evident. For example, submerged seagrass meadows are a major marine habitat and ecological component of shallow tropical coastal waters, but most people are not conscious of their existence, much less of their important role. Consequently, they are being depleted by widespread dredge and fill activities and by water pollution, including brine disposal from desalinization plants and oil production facilities, waste disposal around industrial facilities, accidental spill of petroleum and petroleum products, and thermal discharges from power plants. The loss of seagrasses -- an important habitat and source of nutrition -- can cause a significant loss in marine life and fisheries production.

Although CAMP programs are created to address broad resource systems, or ecosystems, they have to be based upon detailed knowledge of individual resource units. In tropical countries-- to which this book is oriented -- resource conservation programs may be centered on one or more of the following major resource, or "critical habitat", types: mangrove forests, coral reefs, submerged seagrass meadows, beach-dune systems, and lagoons/estuaries (including embayments). Also because CAMP is particularly focused on physical habitat conservation, the following discussion of resources, their vulnerabilities, and conservation needs, emphasizes these five critical habitat types. Islands are sometimes described as a separate ecosystem type, but they can also be considered as aggregations of the various habitats mentioned above.

While it is useful and practical to focus on individual habitat types, one must not forget that they exist only as components of wider coastal systems. The complexity of biotic systems and the interrelatedness of their components require that each coastal water 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 water systems must be considered -- shoreland watersheds, shoreline areas, and offshore waters are all linked to the coastal system (Figure 2.1). Therefore, the ecosystem defined must embrace a complete and integral unit, one that includes a coastal water basin (or

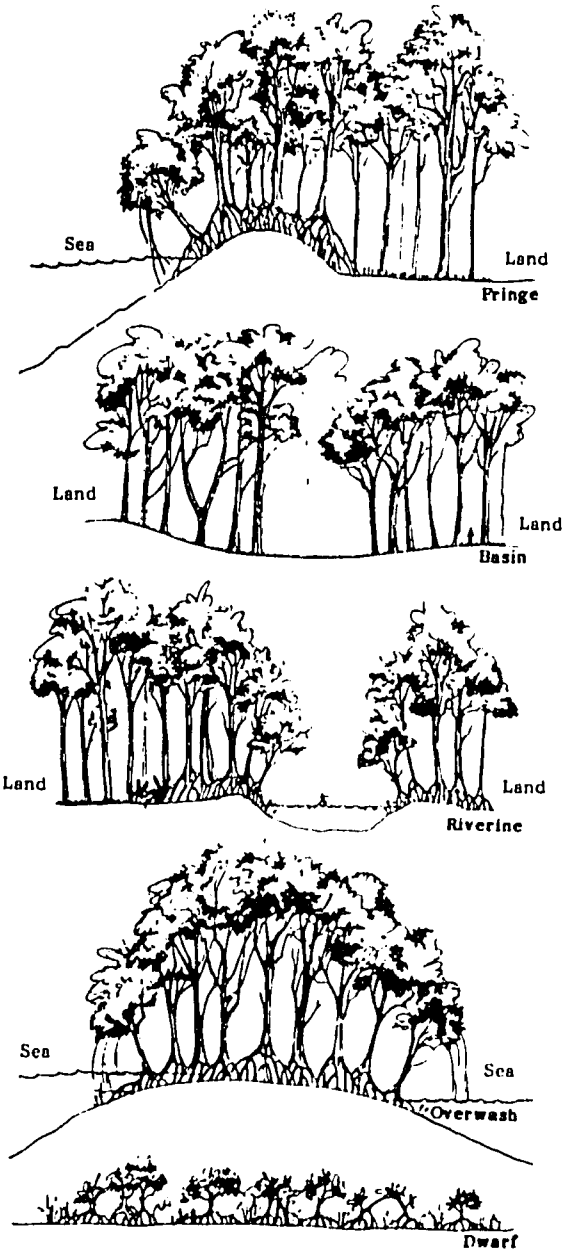


Figure 2.2. Five major mangrove forest structural types (Source: ref. no. 73)

basins) and the adjacent shorelands to the extent that they have significant influence on coastal waters.

Except as otherwise noted, the following discussions of individual habitat types are excerpted from the 1985 book "Coastal Resources Management Guidelines: by S.C. Snedaker and C.B. Getter (73) which was prepared by the National Park Service for the U.S. Agency for International Development (USAID) and is the second in the "Coasts" series, of which this book is the fourth. Specific management guidelines for use in CAMP programs are given in the resources management part (Part I) of the above book for each of the five resource types.

2.3 Mangrove Wetland Systems

The value of the mangrove resource in terms of its marketed products can be expressed in economic terms. The "free" services provided by the mangroves are more difficult to measure and consequently are often ignored. These "free" services would cost considerable energy, technology and money to be provided from other sources. Since this is seldom taken into account, the total value of the mangrove resource is usually quite significantly under-estimated (36).

Moreover, mangroves and mangrove ecosystems are often regarded as wastelands of little or no value unless they are "developed". All too often, this term means conversion of the mangrove ecosystem to some other form of use assumed to be of greater value. This approach to utilization is based on a failure to recognize the natural values of mangrove ecosystems that are expressed as a variety of products and services (36).

The resource: Some 24 million hectares of mangrove forests occur in coastal areas of subtropical and tropical countries of the world. Mangroves are found along sheltered coastlines where wave activity tends to be minimal. The term mangrove refers to any of dozens of species of trees that are capable of living in saltwater and salty soil regimes. Mangrove forests occur in a variety of configurations (Figure 2.2). Because mangroves are sensitive to frost and freezing temperatures, the latitudinal limit of this type of wetland is determined by temperature. Areas where mangroves occur are shown in Figure 2.3.

Uses: Ecologically, mangrove communities have a variety of recognized roles in the areas where they occur. A prominent role is the production of leaf litter and detrital matter which is exported to lagoons and the nearshore coastal environment. Through a process of microbial breakdown and enrichment, the detrital particles become a nutritious food resource for a variety of marine animals. The organic matter exported from the mangrove habitat is utilized in one form or another by the inhabitants of estuaries/lagoons, near coast waters, seagrass

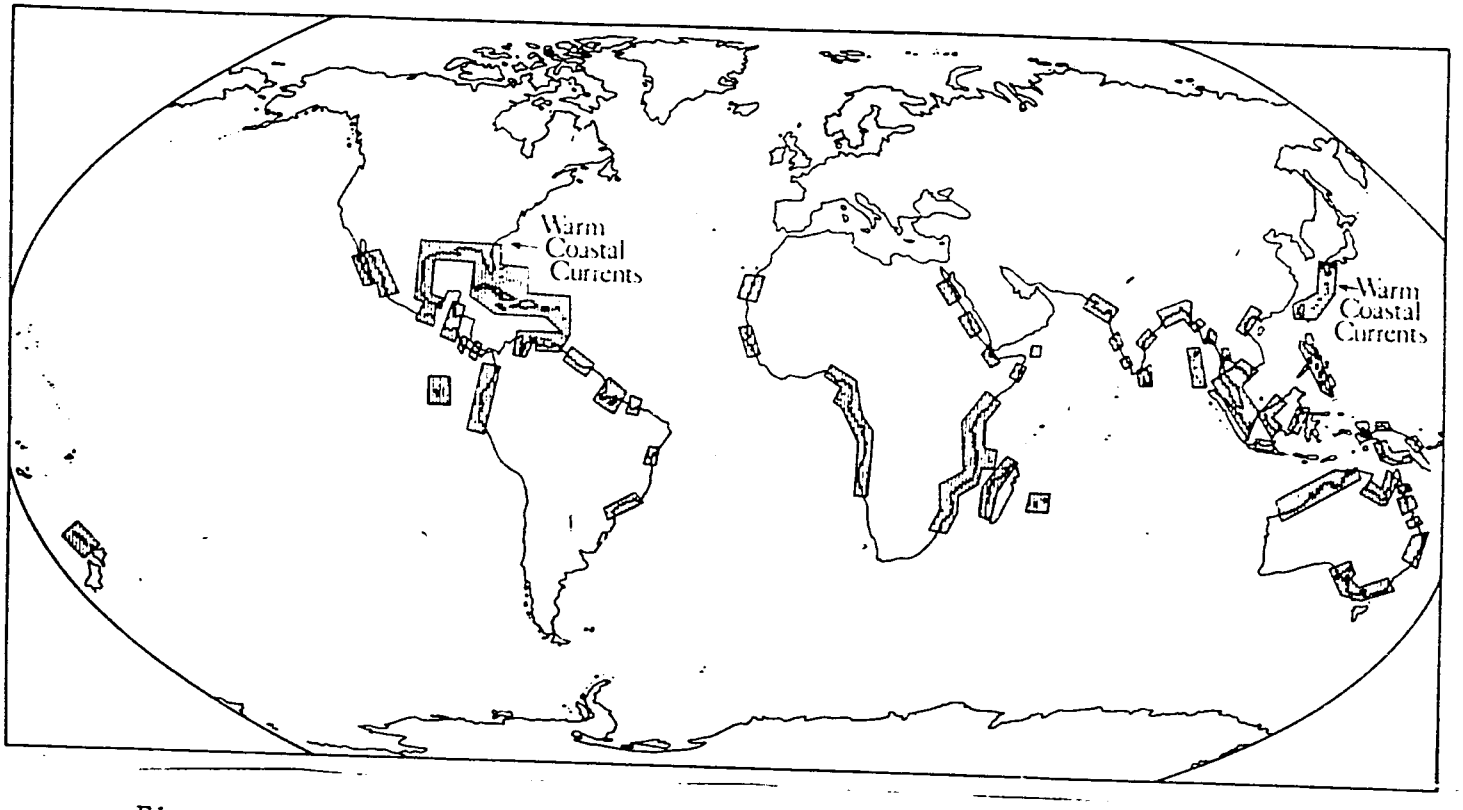


Figure 2.3. Geographical distribution of the world's mangroves
(Source: ref. no. 73)

meadows, and coral reefs which may occur in the area. Most commercial shrimps and many fish species are supported by this food source.

Mangrove ecosystems also provide a valuable physical habitat for a variety of important coastal species. Waterfowl and shorebirds are well known and highly valued inhabitants of wetlands, as are alligators and muskrats. Less evident, but equally important, inhabitants are crabs, shrimp, and the important juvenile stages of commercial and sport fishes, along with numerous forage species of fish and invertebrates (26).

According to Jothy (45), a strong relationship has been found to exist between capture fisheries in tropical coastal waters and the hectarage of mangroves. This is especially true of the shellfish resources, as seen in the sparsely mangrove forested east coast and densely forested west coast of Peninsular Malaysia. From fisheries statistics, an estimated 31 percent of the fisheries of Peninsular Malaysia (about 200,000 tons) may be said to have some association with the mangrove ecosystem. In the west coast of the peninsula alone, an estimated 41 percent of the landings (about 178,000 tons) may be associated with the mangroves (45).

In many parts of the world, human populations rely heavily upon the variety of products that can be obtained from mangrove forests such as timber, pulpwood and chips, fuelwood and charcoal, honey production, and sundry domestic products (Figure 2.4). It is the various uses of mangrove forest products and the plant and animal material associated with them that lead to pressures concerning their utilization (Table 2.2). Integrated CAMP planning, which involves simultaneous attention to all sectors and considers the maximum sustained yield of each resource, is an approach which is especially important in the management of mangrove forests.

Shoreline mangroves are recognized as a buffer against storm-tide surges that would otherwise have a more damaging effect on low-lying land areas. Also, mangroves are often noted for their ability to stabilize coastal shorelines that would otherwise be subject to erosion and loss. Conversely, if left in place they can preempt development sites that are at too low an elevation and are hazardous real estate sites.

Impacts: In general, the mangrove ecosystem is fairly resistant to many kinds of environmental perturbations and stresses. However, mangroves are sensitive to excessive siltation or sedimentation, stagnation, surface-water impoundment, and major oil spills. These actions reduce the uptake of oxygen for respiration which results in rapid mangrove mortality. Salinities high enough to kill mangroves (+ 90 ppt) result from alterations in the freshwater inflow and flushing patterns from dams,

dredging, and bulkheading. On the other hand, mangrove forests help maintain coastal water quality by extracting chemical pollutants from the water.

A major problem that affects mangrove habitats results from man's desire to convert mangrove areas to residential, commercial, industrial, and agricultural real estate by land filling. In addition, there is an increasing demand for forest wood products that results in the exploitative clear-felling of the forests. In these situations, the basic habitat and its functions are lost, and that loss is frequently greater than the value of the substituted activity on a long term basis. In general, these kinds of problems are generated by ignorance of the values of the functioning mangrove system and the absence of integrated planning that takes these functions and values into account.

The most difficult conflict facing many countries today is replacement of mangrove areas with aquaculture ponds (shrimps, milkfish, etc.). For example, in the Philippines between 1967 and 1977, aquaculture facilities accounted for 80 percent of the loss of mangrove (84). In Ecuador, mangrove loss for ponds is implicated in the crisis in shrimp production ("the post-larvae crisis") of the early 1980's. As stated by Snedaker et al. (74): "To the extent that mangroves are being destroyed...there is loss of marine seafood production."

Using the Philippines as an example, the major problems concerning mangroves that should be addressed by a CAMP-type program are [56]:

- Socio-cultural attitude towards mangrove resource utilization. There still exist different attitudes towards the utilization of this coastal resource. This may be attributed to some existing beliefs which, up to the present, are still practiced. This is somehow related to the manner of how people treat it for their own use.

- Conflict between ecological function and economic resource. The mangrove area plays a significant role economically and ecologically. One of the environmental concerns is the issue on mangrove forest destruction. The conversion of the mangrove area into fishponds and into reclamation sites has been increasing so that its ecological significance has decelerated. From 1952 through 1975, the area used for aquaculture has increased from 88,681 hectares to 176,032 hectares. The increasing trend of developing the mangrove area into fishponds may have negative impacts on the coastal ecosystem. The management of the mangrove ecosystem

Table 2.2. Products of mangrove ecosystems (Source: ref. no. 68)

A. Mangrove forest products	
Fuel	Firewood (cooking, heating)
	Charcoal
	Alcohol
Construction	Timber, scaffolds
	Heavy construction (e.g. bridges)
	Railroad ties
	Mining pit props
	Boat building
	Dock pilings
	Beams and poles for buildings
	Flooring, panelling
	Thatch or matting
	Fence posts, water pipes, chipboards, glues
Fishing	Poles for fish traps
	Fishing floats
	Wood for smoking fish
	Fish poison
	Tannins for net and line preservation
	Fish attracting shelters
Textiles, leather	Synthetic fibres (e.g. rayon)
	Dye for cloth
	Tannins for leather preservation
Food, drugs and beverages	Sugar
	Alcohol
	Cooking oil
	Vinegar
	Tea substitute
	Fermented drinks
	Dessert topping
	Condiments from bark
	Sweetmeats from propagules
	Vegetables from propagules, fruit or leaves
	Cigar substitute
Household items	Furniture
	Glue
	Hairdressing oil
	Tool handles
	Rice mortar
	Toys
	Matchsticks
	Incense
Agriculture	Fodder, green manure
Paper products	Paper of various kinds
Other products	Packing boxes
	Wood for smoking sheet rubber
	Wood for burning bricks
	Medicines from bark, leaves and fruits
B. Other Natural Products	
Fish	
Crustaceans	
Shellfish	
Honey	
Wax	
Birds	
Mammals	
Reptiles and reptile skins	
Other fauna (amphibians, insects)	

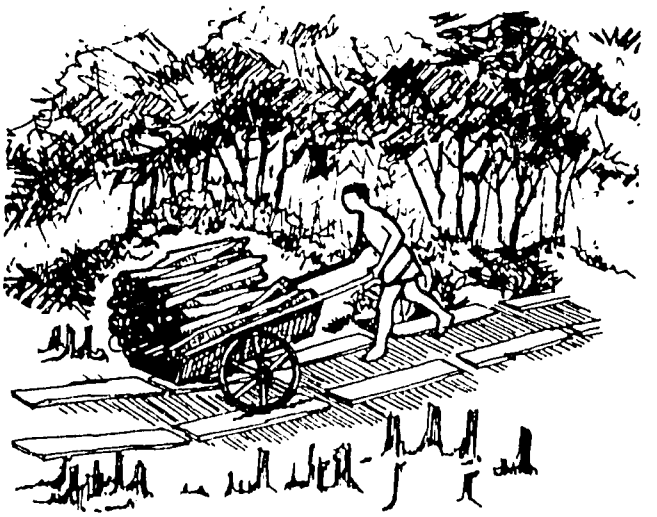


Figure 2.4. Extraction of mangrove billets on a cart pushed along plank tracks. (Source: ref. no. 73)

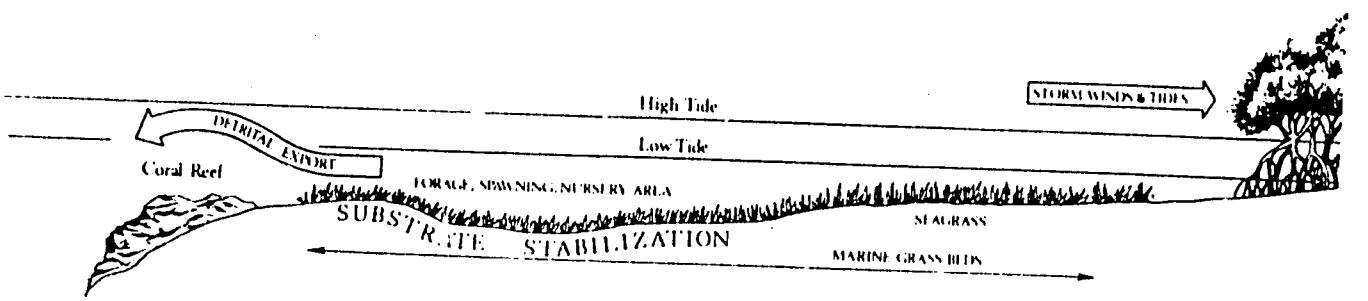


Figure 2.5. Beneficial roles of seagrasses in tropical coastal waters. Seagrass beds hold the substrate, provide special sanctuary for the young of many fishes, provide food for grazers (parrot fish, conch), and export particles of detritus (plant material) to be eaten by many smaller organisms in the food chain (Source: ref. no. 73)

with regard to its utilization should be given attention.

- Degradation of the mangrove ecosystem through denudation. Thousands of hectares of mangrove areas are being declared for such uses as land reclamation, human settlements and other commercial and industrial sites and purposes. The removal of the mangrove stands for such purposes has caused the deterioration of the coastal area.

It is important to recognize that many of the forces which detrimentally alter mangroves have their origins outside the mangrove ecosystem. Therefore, programs for mangrove conservation and utilization require integrated planning. One solution is to ensure that proposed developments and incidental actions that could affect the mangrove ecosystem are reviewed and approved by a governmental agency operating a CAMP-type program. Specific conservation guidelines for mangrove forests are given by Snedaker and Getter in Coastal Publication No. 2 (73).

Other intertidal resources: Intertidal areas of the coastal edge are sometimes in marshes (grasses and rushes) or in bare tide flats. Marshes, where they exist, serve many of the same ecological purposes as mangrove forests. They assimilate nutrients and convert them to plant tissue which is broken into fine particles and swept into the coastal waters when the leaves die. This plant detritus provides the food base for many important species of fish and shellfish. In addition the marsh provides a special habitat for many species, including the young of commercially important species.

Some estuaries and lagoons have extensive areas of tideflat which are important in processing nutrients for the ecosystem and providing feeding areas for fish at high tide or birds at low tide. In many estuaries and lagoons, tideflats also produce a high yield of shellfish. Mud flats are often important energy storage elements of the estuarine lagoon ecosystem. Where mud flats are not present, vital dissolved chemical nutrients (such as phosphates, nitrates, nitrites, and ammonia) can be swept out with the ebbing tides, reducing the energy supply to the food chain. The mud flat serves to catch the departing nutrients and hold them until the returning tide can sweep them back into the wetlands. There appears to be an optimum balance between the proportion of wetland (swamp or marsh) to mudflat area which is vital to the stability and the continued existence of both systems.

2.4 Seagrass Systems

Submerged seagrasses dominate the shallow waters of many temperate and tropical coastal environments of the world.

Appropriate conditions for sea grasses are a suitable shallow substrate having water of a high transparency and relative freedom from strong wave action. Their broad distribution is attributable to the fact that seagrasses can tolerate wide salinity ranges (from nearly fresh water to hypersaline seawater). Seagrass beds, or meadows, are highly productive and valuable resources, which enrich the sea and provide shelter and food for some of the most important and valued species of fish and shellfish (Figure 2.5).

The resource: Seagrasses grow in shallow waters where the currents are not too swift, wave action is low, and the bottom sediments are favorable. They occur on submerged bottoms at levels of abundance related to depth and other variables--salinity, temperature, turbidity, currents and so forth. They prosper in the quiet, protected waters of healthy estuaries and lagoons, often in beds, or meadows, that are easily delineated for classification as critical habitat areas. They are normally found in shallow areas where light can readily penetrate and enable photosynthesis to occur. Seagrass beds extend shoreward to the point where wave action prevents their establishment.

High productivity of seagrass habitats is associated with both seagrass growth and the production of "epiphytes" attached to the leaf surfaces. For example, primary productivity (amount of plant production) for two common seagrass species has been shown to be higher per acre than for average corn and rice cultivation in the U.S.A. (58).

Seagrasses intermingle with both mangrove and reef communities at their respective seaward and landward boundaries. Submarine meadows of seagrass frequently provide the link between mangrove and coral reef ecotypes (Figure 2.6). The migration of animals at various life stages from one ecosystem to another for feeding and shelter, coupled with currents that transport both organic and inorganic material from runoff and tidal flushing, ties the offshore coral reefs to nearshore seagrass beds, and the seagrass beds to mangrove estuaries (7).

Uses: Wherever they do occur, seagrass meadows are essential elements of coastal ecosystems. They provide a substantial amount of nourishment, nutrients, and habitat. These meadows provide vital places of refuge not found in the open ocean. They attract a diverse and prolific biota and serve as essential nursery areas to some important marine species. Seagrass meadows are also known to trap and bind sediments which otherwise would move freely with the water as particulate pollutants.

Impacts: Although seagrasses are a relatively hardy group of plants, they are damaged by unfavorable conditions such as excessive siltation and turbidity, shading, and water pollution,

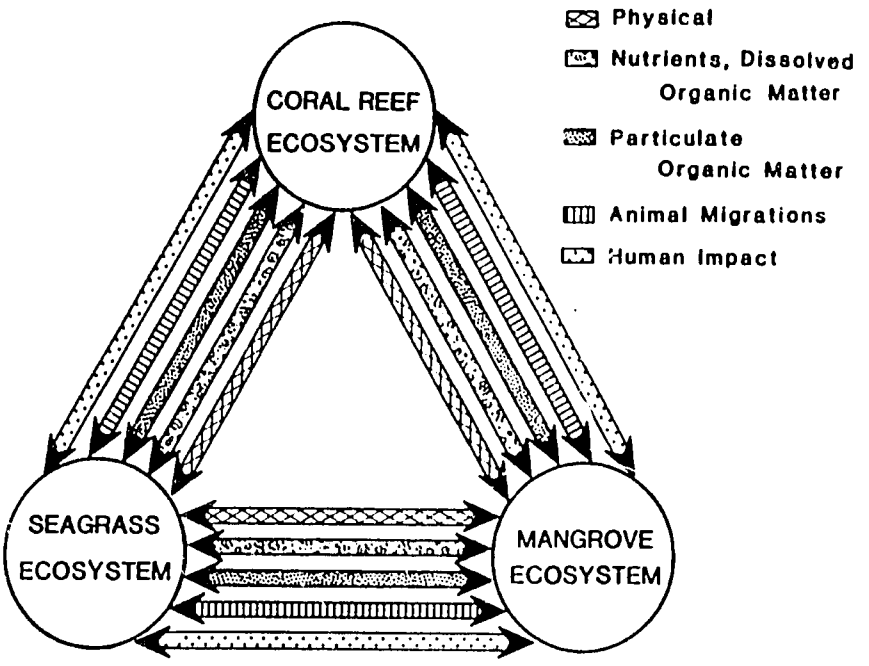


Figure 2.6. Interactions among three major tropical habitats of the coastal area (Source: ref. no. 61)

as well as fishing practices that use bottom trawls which scrape and plow the meadows. Turbidity and shading reduce ambient light levels in the water, resulting in a lower rate of photosynthesis or, in extreme cases, completely inhibiting it. Certain pollutants in seawater not only have toxic effects on the growth and development of seagrasses, but also on many of their animal associates. Seagrasses are sensitive to hot-water discharges and, for example, are usually eliminated from areas closest to cooling water discharge points of coastal power plants. Other major threats are dredging and filling operations in seagrass meadows; for reasons that are not clearly established, seagrasses only slowly, if at all, naturally revegetate areas that have been dredged. Typically, when a seagrass meadow is eliminated, its fauna also disappears from the area. The disappearance of seagrass communities may go unnoticed because, unlike mangroves and coral reefs, seagrass communities are not visually obvious to most observers.

Specific CAMP guidelines to conservation of seagrass meadow ecosystems may be found in Coastal Resources Publication No.2, by Snedaker and Getter (73).

2.5 Coral Reef Systems

Coral reefs occur along most shallow, tropical coastlines where the marine waters are clean, clear, and warm. They are one of the most productive ecosystems in the world. Although in-situ primary productivity may be relatively high, the reef system is highly subsidized by nutrients and plankton brought to it by water currents and by excreta of reef fishes when they return from off-reef forays. Consequently, the basis for the high productivity of the coral reef ecosystem is a combination of the production of the reef with support from its surrounding environment.

The resource: "Fringing" reefs -- those contiguous with the shore -- are the most common and widespread of the reef structural types. Although they occasionally extend into the intertidal zone, fringing reefs are most usually found below the low tide level. Their inshore distribution renders them more susceptible to degradation from coastal activities than other reef types. One of the largest fringing-reef formations lies along the Saudi Arabia 1100 mile Red Sea Coast which is noted for an absence of freshwater (and sediment) runoff (73,23,64).

"Patch" reefs are isolated and discontinuous patches of reefs, often lying shoreward of offshore reef structures. "Barrier" reefs are linear, offshore reef structures that run parallel to coastlines and arise from submerged shelf platforms; the water area between the shore and reef is often termed a "lagoon". The world's largest barrier reef system, the Great Barrier Reef, occurs off the Queensland coast of Australia and

the second largest lies along the coast of Mexico, Belize, and Honduras.

"Atolls" are circular or semicircular reefs that arise from subsiding sea floor platforms as coral reef building keeps ahead of subsidence.

The corals themselves are relatively slow growing colonies of animals with growth rates ranging from one-tenth to ten centimeters per year in height. The large and diverse animal populations associated with the reef are supported by the high productivity of the reef and its ability to assimilate and hold nutrient and recycle it rapidly.

With few exceptions, coral reef development occurs only where seawater temperatures remain above 20 degrees Celsius. As a result, most coral reefs are found in the tropics with the exception of higher latitudes where there are warm ocean currents. The areas of greatest coral reef development are the Western Pacific and Indian Oceans and, to a lesser extent, the Caribbean Sea, including the Bahama Islands area.

Uses: Coral reefs have important economic outputs. Coral reefs contribute to fisheries in three ways: fishing directly on the reef; fishing in shallow coastal waters where coral reefs support food webs, life cycles, and productivity; and fishing in offshore waters where the reef's high productivity may contribute to support of "high seas" fishes. According to a World Resources Institute report (84) approximately one third of the world's fish species live on coral reefs.

Artisanal fisheries dependent on coral reefs have been reported to account for up to 90 percent of the fish production in Indonesia and up to 55 percent of production in the Philippines. This harvest contributes to more than 54 percent of the protein intake of all Filipinos.

Reports of fish yields from coral reefs appear to vary widely from less than 1 metric ton per square kilometer per year to almost 20 metric tons per square kilometer per year. Present evidence suggests that a sustainable harvest of all edible fish, crustaceans and mollusks averaging 15 metric tons per square kilometer per year could be derived from most shallow coralline areas (less than 30 meters deep). The theoretical potential harvest on a global basis therefore, amounts to 9 million metric tons per year, 12 percent of current total world fish production (84).

In addition to fisheries on the coral reefs, large yields obtained from offshore marine fisheries are supported by the reef system. This yield includes many species whose existence is dependent upon the reef; for example, the diet of tuna caught off

New Caledonia consisted of 58-73 percent food items of coral reef origin. Catches from coral reefs often comprise a significant portion of the local fisheries. In western Sabah, for example, reef fishes comprise nearly one quarter of the total catch of the Kudat and Kota Kinabulu areas. In many areas of the world including the Laguna de Chiriqui (Panama) and much of the Philippines the survival of whole communities depends upon fish and shellfish from the reefs.

Coral reefs support booming tourist industries in many countries. Catering to snorkelers, divers, underwater photographers, sightseers, and fishermen, reef tourism produces billions of dollars of foreign exchange earnings annually. One reef system alone -- Pennekamp State Coral Reef Park (Florida, U.S.A.) -- attracts 1.5 million visitors per year. More than half of the foreign exchange earnings of the Cayman Islands are from coral reef based tourism. There are now 45 protected coral reef areas (including national parks) in Caribbean Countries, but in the absence of broad based coastal conservation programs, many have become seriously degraded (40).

Coral reefs also serve as natural protective barriers, deterring beach erosion, retarding storm waves, allowing mangroves to prosper, and providing safe landing sites for boats. While Sri Lanka's comprehensive national CAMP program (previously discussed) is aimed primarily at reducing risks from natural hazards, beach erosion and coastal flooding, a strong component is coral reef protection, which necessitates the cessation of coral reef mining (2).

Impacts: Unfortunately, there are numerous destructive forces at work and important coral resources are being degraded at a rapid rate. some of these forces can be easily controlled through CAMP programs, but others present serious socio-economic and political problems for many countries. For example, Sri Lanka is faced with finding alternative jobs for thousands of coral miners that must be put out of work to protect national coral reef resources.

In addition to mining for carbonate, corals are often harvested for sale as souvenirs to tourists and for export to collectors. The market for these coral species is often quite lucrative and usually export-oriented. In the Philippines, for example, local markets comprise the smaller portion (10%) of the total and foreign exports (primarily to the United States, Europe, and Japan) make up the larger share.

Other damaging activities include the following: 1) siltation and sedimentation created by dredging, filling, and related construction activities; 2) pollutants, including spilled oil, industrial wastewater, and domestic sewage; 3) discharge of large volumes of fresh water as may result from

diversions and storm-water outfalls; 4) destructive fishing practices, including dynamite; 5) collection for sale in the aquarium trade; and 6) tourist visits to reefs which result in breakage from boat anchors and hand and foot damage. In addition, there are damages from natural causes such as: 1) out breaks of reef destroying animals such as crown-of-thorns starfish; 2) diseases like whiteband (kills elkhorn coral) and blackband (kills large structural corals); 3) hurricanes that smash the coral and "sandblast" away the living tissue; and 4) die off or depletion of essential symbionts, such as parrotfish and sea urchins that clean the reef of algae.

Coral reef degradation has serious consequences for tourism, fishing, beach stability and, particularly, for coastal/marine parks. For example, most of the 21 countries and 49 parks (or reserves) in the Caribbean with coral resources have problems (40). When serious, coral reef degradation can ruin a park and cut severely into tourism. Some reefs are virtually beyond repair (those closest to settlements) but many that are degraded could still be returned to good or fair condition if rehabilitation techniques were available. A science task force recently (Dec.,1987) met to consider the potential of various techniques for rehabilitating damaged coral reefs (25).

In the Philippines, where over 70 percent of coral reefs have been degraded and depleted (original inventory 27,000 km²), the following are listed as the major causes [56]:

- Siltation. Among the factors contributory to the siltation of coastal areas are soil erosion and the dumping of mine tailings. These erosion materials and mining wastes are carried with stormy water runoff into coastal waters, thus damaging coral communities by siltation.

- Destructive fishing practices. Some of the destructive fishing methods are dynamite fishing, trawling, and muroami. These illegal fishing methods are causing adverse effects to the reef habitat. The findings of an intensive coral survey for 1982 reveal that in 633 sites investigated over the entire archipelago, only 5.5 percent showed excellent cover; 24 percent, good; 38.3 percent, fair; and 32.1 percent, poor.

- Exploitation. Reef corals are harvested in large quantity for decorative uses. In many parts of the world corals are over-exploited, often because of ignorance of the negative effects on the coral ecosystem. The uncontrolled exploitation of corals is a major cause of degradation of coral resources and depletion of reef fishes.

Most of the above types of problems can be effectively addressed through CAMP-type programs which emphasize resource management coordinated with development management. Specific conservation guidelines are given by Snedaker and Getter in Coastal Publication No. 2 (73).

2.6 Sandy Beach Systems

Beaches are being lost at a rapid rate through much of the world. No tropical region is free of this erosion problem. Serious socio-economic problems may arise with erosion and loss of beaches (e.g. risk to property, loss of international tourism revenue). The problem will increase as long as sea level continues to rise -- presently, at the rate of 1/4 to 3/4 meters per century (vertical). Beach management is an important element of the CAMP-type program and a complex undertaking that should be addressed by professionals in the field.

The resource: Ecologically, the beach is a unique environment occupied by animals that have adapted to the constant motion of the sand, gravel or shell. Many important birds, reptiles, and other animals nest and breed on the berm and open beach, as well as feed and rest there. For example, sea turtles (including such endangered species as the loggerhead and green turtle) come ashore during the spring and summer to lay their eggs in the "dry beach" above the high-water line. Also, terns and other seabirds frequently lay their eggs on the upper beach or in the dunes (26).

Beaches provide a unique habitat for burrowing species such as mole crabs, coquina clams, razor clams, and others. There may also be a complex intertidal or subtidal community of crustacean organisms that attract shore birds. The shallow waters of the nearshore zone provide habitat for shellfish of many kinds and a wide variety of forage species, which in turn attract fish and birds to feed on them (26).

Beaches occur wherever there is: 1), a flat to moderately sloping nearshore coastal shelf; 2), a source of sand, and 3), strong forces, such as tides and waves, to shape and maintain a beach. The specific form of the beach is controlled by "wave climate", i.e. the frequency, amplitude, and length of the waves. (Note: The paper by M. Hayes in "The Coastal Casebook" (21), Publication No. 3 in this "Coasts" series, presents a detailed technical description of beaches and beach problems).

Technically, beaches consist of unconsolidated sediments transported to shore by wave-generated water currents. Beaches are located between the lowest seaward tide level and the inland limit of the average highest storm waves. The landward limit is often defined by a coastal cliff, a dune ridge, or some engineered structure (where man has altered the coastline). It is

important to realize that the erosional and depositional cycles of beaches respond to forces acting far from the beach itself. Of special importance are offshore shoals and currents, inland dune systems, and river outflows.

Beaches are not stable forms, they are, instead, dynamic landforms, constantly subject to erosion and/or accretion. Differences in beach form and position reflect the local balance or imbalance between deposition (gain) and erosion (loss). On a worldwide basis, erosion (natural and man-induced) dominates over deposition, which is partly due to the global rise in sea level. Consequently, there is serious loss of beach and beachfront in many parts of the world.

Uses: Beach and dune systems in their natural state provide a buffer against storm-caused erosion and storm breaching. The beach exists in a state of dynamic tension, continually shifting in response to waves, winds, and tide and adjusting back to equilibrium. Each part is capable of receiving, storing, and giving sand, depending on which of several constantly changing forces is dominant at the moment. This keeps the slope or profile intact by balancing the sand reserves held in various storage components in the beach system -- dry beach, wet beach, submerged offshore bar, etc. -- as well as in the dune area behind the beach (Figure 2.7).

The natural forces at work are immense. The power of man to hold the beach at a higher than natural profile, or "angle of repose", in order to protect property is quite limited. Structural solutions to beach erosion and protection of duneland property from the hazards of sea storms may be expensive and are often temporary or counterproductive. Groins, seawalls, and other forms of protection may have complex and unanticipated secondary effects. These structures (groins, seawalls, etc.) intended to stabilize the beach may actually deflect and reduce supplies of sand to a level no longer capable of replenishing losses caused by storms. Then the beach may be lost, even while the structure remains. A row of parallel groins may force sand to move further offshore with the littoral drift, from one groin tip to another, instead of moving along close to the beach, thus causing a net loss of sand. Bulkheads tend to accelerate beach loss because they reflect the force of waves downward and back into the sand, which causes the beach to be scoured away.

Impacts: It should be clearly understood that beach problems usually result from human actions. Normally, if nothing is built either on the beach or next to the beach, it will remain as long as the process of natural replenishment continues. It may shift with the seasons, yield sand temporarily to storm erosion, slowly recede landward with rising sea level, or accrete seaward with natural shifts in the flow of ocean currents which bring more sand. Mobile and responsive, the beach will usually remain over

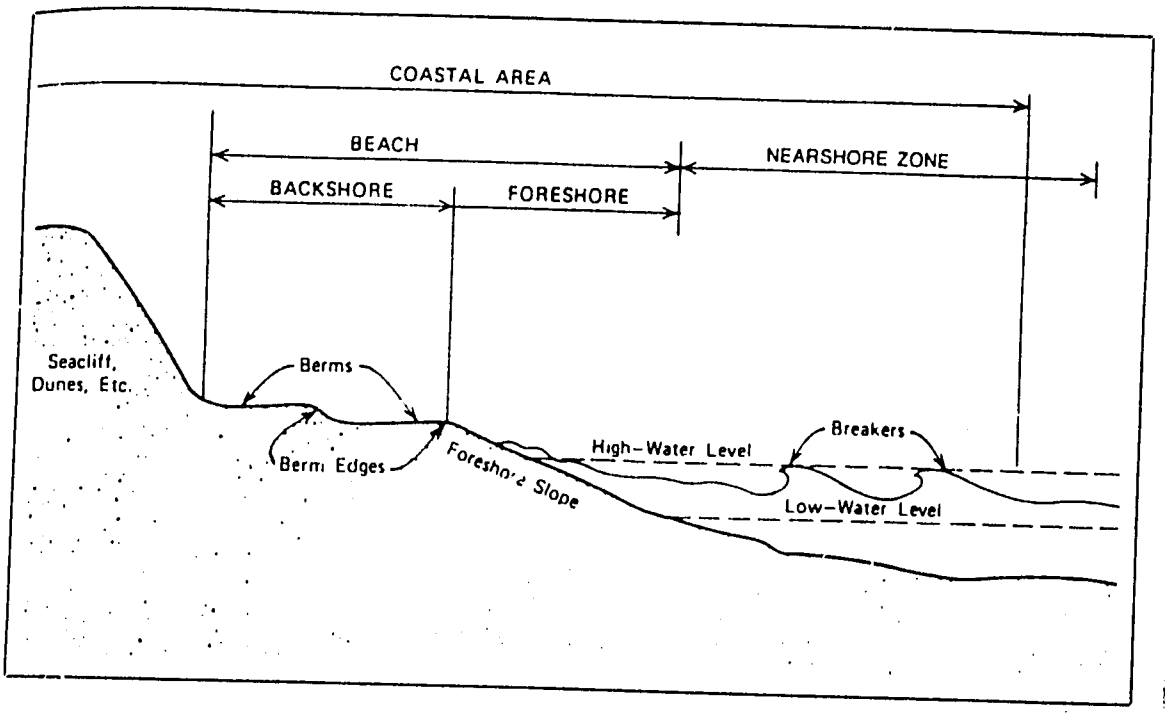


Figure 2.7. The anatomy of a typical beach front. (Source: ref. no. 27)

the years, but even if sea level or other natural factors cause erosion, problems will not usually emerge unless there are houses or other structures placed near the beach. If the natural movements are restrained with bulkheads or groins so as to hold the beach, an unending chain reaction of problems will be started which can be solved only by the very expensive process of continuously transporting sand (e.g. by pumping it from the ocean bottom) onto the beach. This remedy is so costly it is not available to most communities.

In some cases, beachfront development will have already progressed so far that it is too late for nonstructural remedies alone and a combination approach will be required. Some commendable engineering structures have been devised to supplement natural processes and to reduce further damage where development is quite intense. But there are so many examples of failure of the structural approach (Figure 2.8) that caution is indicated. For example, the Miami beach front was all but eliminated by extensive seawalls and groin fields. The lost sand had to be replaced in a beach replenishment project that cost over 80 million dollars (U.S.) and the sand will sooner or later be washed away by big storms and Miami will have to start over.

Special attention must be given to the problems of receding beaches, often caused partially by human activity and partially by the natural trend of a rising sea level. As the sea level rises, the shoreline is forced inland because there is little to anchor it permanently in place.

It must be remembered that the key to the natural protection provided by the beachfront is the sand which is held in storage and yielded to storm waves, thereby dissipating the force of their attack. Consequently, taking sand from any part of the beach -- dry beach, wet beach, bar or the nearshore submerged zone -- can lead to erosion and recession of the beachfront. Therefore, beach conservation should start with the premise that any removal of sand is adverse, whether for construction fill, concrete aggregate, or any other purpose and should be prohibited.

The ocean beachfront is a most hazardous place to build. The berm/foredune/backdune system (where these exist) signal high risk locations for buildings. Keeping development far enough inland to avoid the high risk zone is important in natural hazard prevention efforts. Therefore, a setback line should be delineated at a safe point inland from the beach and all construction kept behind this line.

Since the main threat to the beach is usually from development on land next to it, beach protection requires coordinated management of the beach itself and the land behind it, including a need to limit buildings, prevent excavation, and

Figure 2.8. Erosion of seawall at Kilkhida on the southeastern Black Sea coast. (Source: ref. no. 18)

control beach protection and inlet structures. The general goal for the management program should be to maintain the beach profile by protecting both the natural processes that supply the beach with sand and the sand-storage capacity of the beach elements themselves. Meeting this goal will require careful examination of conservation needs, natural processes, building practices, and corrective engineering proposals that affect whole beach systems. This process can be enhanced through a broad CAMP program.

Specific guidelines for beach and dune conservation are given by Snedaker and Getter (73) in Coastal Publication No. 2.

2.7 Lagoon and Estuary Systems

The subject here is coastal embayments; that is, sheltered water bodies that have restricted access to the open sea, including lagoons and estuaries. There is some ambiguity in the terms "lagoon" and "estuary". Coastal lagoons can be technically defined as "sheltered basins which maintain either temporary or permanent connections with the sea". In contrast, estuaries are considered to be "semi-enclosed bodies of water which are permanently connected to the open sea and whose waters are diluted by freshwater drainage (often a river mouth)". The major distinctions between the two types of embayment are: 1), fresh water that is received (estuaries receive a regular and substantial amount), and 2), the degree of access to the sea (often determined by the presence of a confining depositional sandbar characteristic of lagoons). It should be noted that the "lagoons" formed by coral reefs are quite different water bodies and are not included in this discussion.

Estuaries in some form exist throughout the tropics except in arid/semiarid region (where major rivers are few and discharge is sporadic) and on small islands. Lagoons also exist widely and are estimated to occupy approximately 13 percent of the world's coast. Areas of particularly extensive lagoon/estuarine environment include Brazil, West Africa, the Bay of Bengal shores of India and Bangladesh, and the Atlantic and Gulf of Mexico coasts of the United States.

Both estuaries and lagoons maintain exceptionally high levels of biological productivity. But primary (plant) productivity values will be found to vary according to dominant plants, latitude, time of year and certain critical and limiting physical and chemical inputs entering the ecosystem.

Among the more important underlying factors which explain the high production levels of lagoons and estuaries are: 1), the key role of fresh and marine waters in providing and renewing nutrients, organic material, and oxygen; 2), solar radiation which is maximized as an energy source because of the

characteristic shallow depths of these areas; and 3), the high mixing rates which assist gas exchange, nutrient circulation, and waste removal (Figure 2.9). Also significant is the amount of wetlands, seagrass beds, and other critical habitat encompassed by the lagoon or estuary.

Uses: Lagoon/estuarine ecosystems play important ecological roles including: 1), providing a source of nutrients and organic materials to both coastal and freshwater areas through tidal circulation; 2), providing habitat for a number of commercially or recreationally valuable fish species which depend on the basin floor and adjacent mangroves for protection and food; and 3), serving the needs of migratory nearshore and oceanic species which require shallow, protected habitats for breeding and/or sanctuary for their young (nursery areas). Thus, these ecosystems play a major role in the life cycles of economically important finfish and shellfish species by providing feeding, breeding, and nursery habitat (18,84). For example, over 90 percent of all fish caught in the Gulf of Mexico are reported to be estuarine dependent to some degree.

In estuaries, the salinity gradient starts with a high level in the ocean, decreasing inward through the estuary before dropping to near zero at some distance up estuarine tributaries. Figure 2.9 shows that the mid-range of salinities in a true estuary provides a rich feeding zone for fishes, particularly the young "nursery" sizes.

Impacts: The intensive use of estuaries that serve as ports and harbors creates a variety of environmental impacts and severe losses of estuarine natural resources. These coastal water bodies have sustained human settlements dating back to prehistoric periods. In addition to shipping, modern day lagoons and estuaries serve a multitude of purposes including waste disposal, mariculture, recreation, and residential development. Some large lagoons have been drained and/or filled to create real estate or agricultural land, most notably in land-scarce regions (such as in Japan and in the Netherlands). Improperly planned development on the shores of estuaries and lagoons creates a variety of short and long term economic losses and opportunity costs resulting from resource [illegible]

One major [illegible] of lagoon/estuary degradation is their continued usage [illegible] discharge areas. Aside from outright fish kills and [illegible] effects, pollution causes pervasive and continuous [illegible]adation, evidenced by the gradual disappearance of [illegible] or shellfish, or a general decline in the natural carrying capacity of the system. The most likely sources of pollution are agricultural and industrial chemicals and organic wastes. Such contaminants in high concentrations, create a hostile environment that drives away fish, prevents shellfish from reproducing, or undermines the food chain (Figure 2.10).

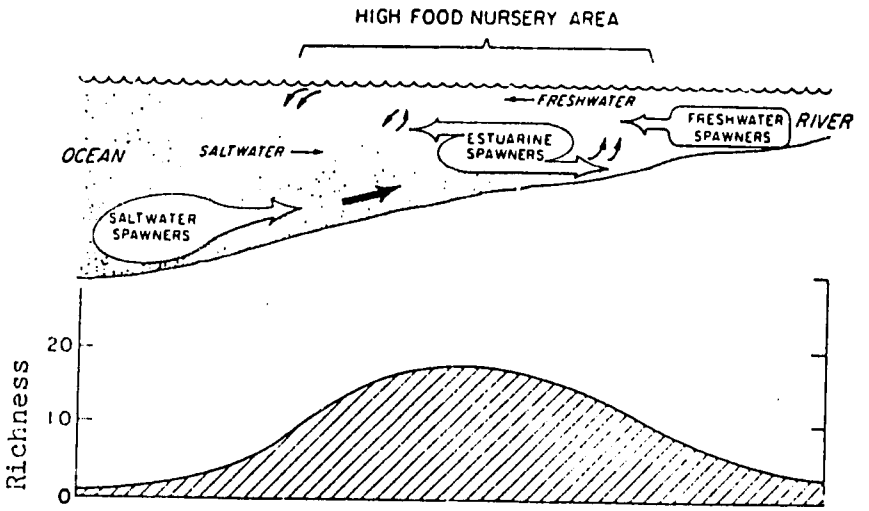


Figure 2.9. Generic cross-section of a true estuary showing that the area of of greatest richness occurs between the ocean and the fresh water source where intermediate salinity is found and where small nursery-stage fish and shellfish find optimum survival conditions (richness is measured as gross primary production 10^{-3} kCAL M^{-2} yr^{-1}). (Source: ref. no. 30)

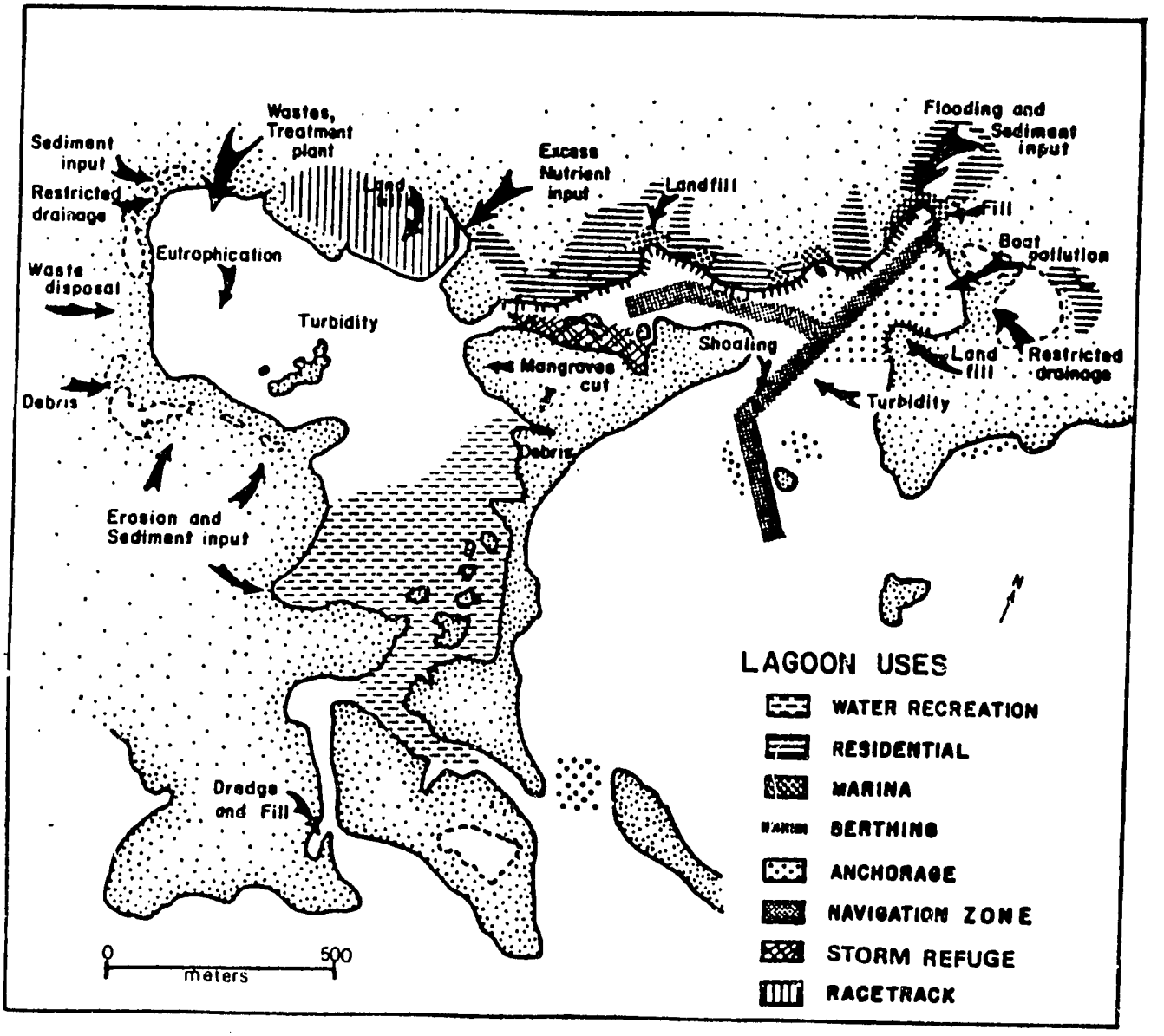


Figure 2.10. Illustration of the type of impacts and stresses that could be addressed in a CAMP Regional Unit Program -- Jersey Bay, St. Thomas, U.S. Virgin Islands. (Source: ref. no. 80)

The increasing usage of many of these water bodies for transport of oil, chemicals, and other toxic materials--whether by ships, barges, pipelines, or railroads -- presents a continuous threat to these fragile ecosystems. This pollution is particularly damaging to estuaries and lagoons because of their sluggish circulation which enables the concentration of pollutants to reach high levels.

Because of the importance of water circulation and flushing in lagoons and estuaries, activities that alter basin configuration can create disturbances with far reaching effects. Major adverse effects stem from construction of causeways and bridges and from dredging undertaken to create navigation channels, turning basins, harbors and marinas. Other problems arise from laying pipeline or excavating material for fill or construction.

An increasing threat to the well being of estuaries/lagoons is the impoundment and/or diversion of rivers at upstream locations. When portions of the coastal watershed system are altered or short circuited, the natural flow pattern is disrupted and estuaries may be subject to surges of fresh water. This not only disturbs the ecosystem, but also increases flood hazards.

The most confined embayments (particularly lagoons) need the maximum of protective controls: protection of wetlands, tideflats, and beaches; additional "buffer strips" above wetlands; control of sewage and storm drainage effluents; safeguards against runoff of soils, fertilizers, and biocides from the coastal upland; restrictions on industrial siting; and so forth. This complex of problems can best be addressed through a CAMP approach.

The estuarine ecosystem has a natural ability for self maintenance and self renewal from human or natural disturbance if its basic configuration and characteristics are maintained. On the other hand, these ecosystems are seriously jeopardized by factors which permanently alter the prevailing salinity, current and nutrient cycling patterns. Conservation of the ecosystem and its resources can be achieved most simply by preventing any significant change from occurring in these factors. It is important to recognize that many of the forces which can detrimentally alter these factors have their origins outside the estuarine system itself (upland agriculture, river diversion). Therefore, estuarine conservation and utilization can benefit greatly from CAMP-type integrated planning and management programs that are linked to upstream management. Specific guidelines are given by Snedaker and Getter in Coastal Resources Publication No. 2 (73).

CHAPTER 3. FUNDAMENTALS OF CAMP PROGRAMS

3.1 Introduction

This chapter articulates the principles and premises underlying the comprehensive, integrated, approach to Coastal Area Management and Planning (CAMP) -- which may also be called Coastal Zone Management (CZM) or Coastal Resources Management (CRM). By any of these designations, the goal should be to manage the coastal area as a unit and to integrate the conservation process with other economic sectors (shipping, mining, housing, transportation, etc.). The main targets of CAMP programs are resource conservation and planning and management processes for coastal economic development. Numerous countries are now organizing full scale CAMP programs and a few (e.g. the United States, Sri Lanka) have programs in operation. Other countries, moving toward comprehensive CAMP programs, have organized partial CAMP programs (e.g. Philippines, Australia).

To accomplish the purposes of CAMP requires the following actions: 1), a policy commitment to its goals; 2), achieving a consensus on conservation objectives; 3), establishment of a governmental office for coordination of coastal affairs; 4), creation of a method to review development projects (environmental assessment); 5), accumulation of essential information, and 6), design and development of effective planning and management programs. The degree to which the above are accomplished governs both the level of CAMP program integration (collaboration among numerous government and private economic sectors) and comprehensiveness (the scope of development and resource management objectives) that can be achieved. High levels of both can be achieved in a full scale CAMP program, the fundamentals of which are addressed in this chapter.

3.2 Delineating the Coastal Area

The boundaries of the coastal area (or "coastal zone") to be addressed in a CAMP-type program depend upon the specific functions of the program. All CAMP programs include both land and water within their boundaries. There is not one standard prescribed set of CAMP boundaries. In fact, the two major program development phases of CAMP may well utilize different boundaries; that is, a wider area will quite likely be identified for the planning phase than for the subsequent management phase. In fact, one purpose of the planning phase is to refine the boundaries and reduce the width of the designated coastal zone to the minimum needed for the management phase.

Where different types, or levels, of management are anticipated in different parts of the designated coastal zone, it may be expeditious to delineate two or more "management tiers". For example, the author has recommended the following three tiers

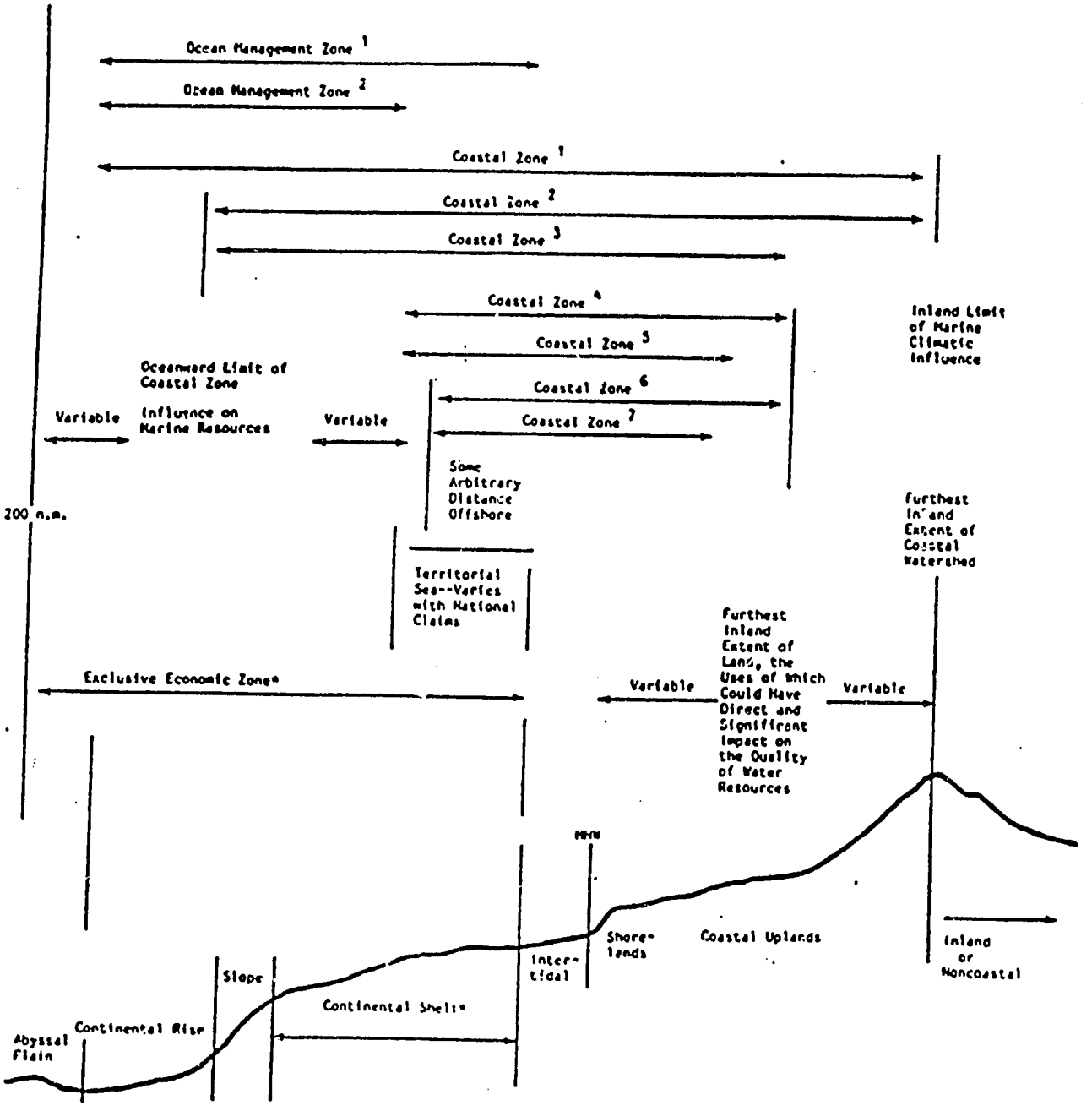


Figure 3.1. Relationship of coastal zone and ocean management zone to coastal environments and ecosystems; See Box 3.1 for key. (Source: ref. no. 75)

Box 3.1

Key to Figure 3.1

Coastal Zone Boundary Type	Inland Limit of Coastal Zone	Outer Ocean Boundary of Coastal Zone
1	Inland limit of watershed or climatic influence	200 nautical miles; boundary of exclusive economic zone (EEZ)
2	Inland limit of watershed or climatic influence	Oceanward limit of coastal zone influence on marine resources
3	Inland limit of land uses which have a direct input on coastal resources	Oceanward limit of coastal zone influence on marine resources
4	Inland limit of land uses which have a direct impact on coastal resources	Oceanward limit of territorial sea
5	Inland extent of shorelands	Territorial sea
6	Inland extent of land uses which have a direct effect	Arbitrary distance, landward of territorial sea
7	Inland extent of shorelands	Arbitrary distance, landward of the territorial sea

* In several areas of the world, the continental shelf extends beyond 200 nautical miles. In these situations, the oceanward boundary of national jurisdictional claims can be the outer edge of the continental margin.

Source: Sorenson et. al. (Ref. No. 75)

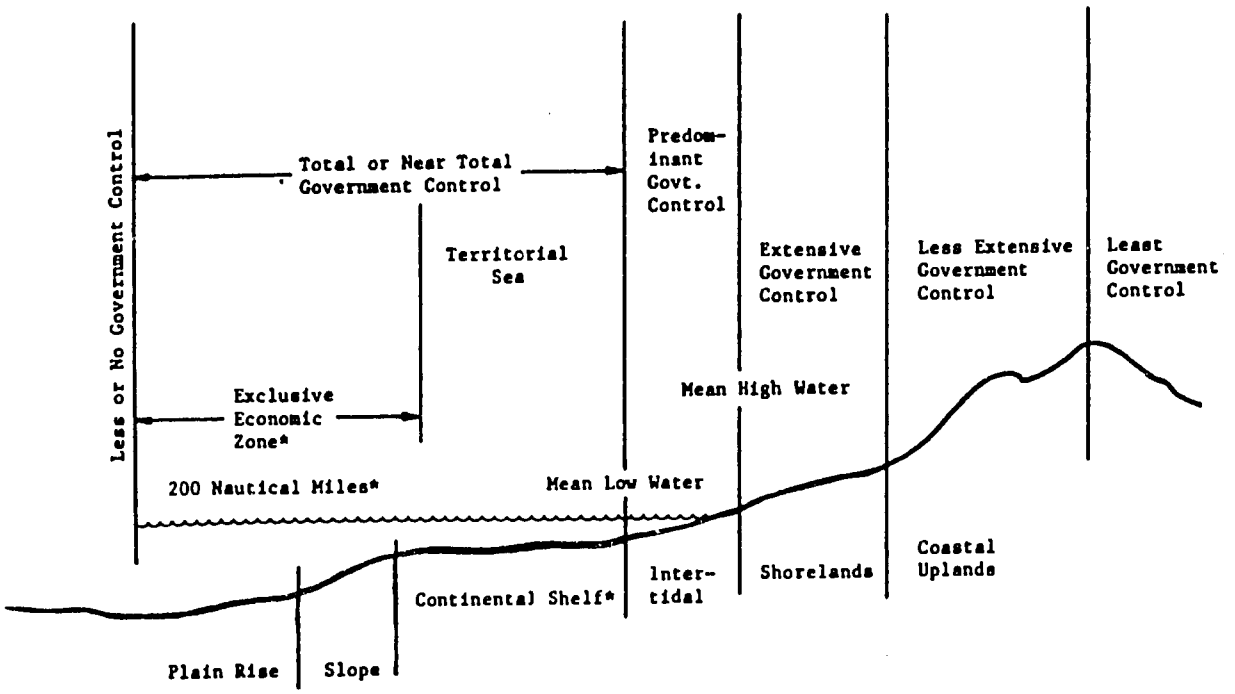
for CAMP programs for U.S. South Atlantic states: 1), the coastal and bay waters (up to the high water mark); 2), the shorelands lying adjacent to the water's edge; and 3), the upland river valleys, drainage ways, and watersheds that discharge into bay and coastal waters (19). This arrangement coincides with major differences in the types of resources dominating each of the three tiers as well as the way governmental authority is structured for them. This approach was generated for the Apalachicola Bay regional CAMP program in Florida (19,29).

By virtually any set of criteria, the coastal zone is a linear band of land and water paralleling the coast -- a "corridor" in planning parlance -- which has a one-dimensional aspect. The second dimension (width from onshore to offshore) tends to be overshadowed by the linearity; thus people talk about being at the coast or on the coast, but never in the coast. Sorenson et al. (84) point out that:

> The image evoked when the term "coastal" is used varies considerably. To some it connotes fish and wildlife, to others beaches and dunes, and to still others broad reaches of land and water. There is agreement, however, that the term coastal conveys the notion of a land-ocean (or estuary) interface. The land-ocean interface has two principal axes--one axis is along shore and the other perpendicular to the shore (or cross shore). For the longshore axis, relatively little controversy arises as to the definition. By contrast, there is considerable discussion about the cross shore axis [the second dimension]. There is general consensus that the cross shore axis profiles a coastal zone of transition between the ocean (or estuary) environment and the terrestrial or inland environment. (See Figure 3.1; Box 3.1 for legend)

In practical terms, the designated coastal zone should include, at a minimum: 1), all coastal lands that are subject to storms flooding by the sea; 2), all intertidal areas of mangrove, marsh, deltas, salt flats, tideflats, and beaches; 3), all permanent shallow coastal water areas such as bays, lagoons, estuaries, deltaic waterways, and near coast water that include seagrass meadows, coral reefs, shellfish beds, submerged bars, and 4), all small coastal islands and other important biophysical features. This "minimal" coastal zone can be as narrow as a few hundred meters (e.g. a California beachfront) or as broad as 50 km or more (e.g. an African river mouth), depending upon the slope and configuration of the coast.

In a broad context, the coastal zone could be as wide as 300 km or more if it were designated to include the entire EEZ, the "Exclusive Economic Zone" (200 miles or 320 km wide), transitional areas, and adjacent upland or river bottoms. The EEZ is very important to small countries because it vastly increases



*In several areas of the world, the continental shelf extends beyond 200 nautical miles. In these situations, the oceanward boundary of the national jurisdictional claim can be the outer edge of the continental margin.

Figure 3.2. Extent of government control with regard to management of marine and coastal resources (Source: ref. no. 75)

their area of economic influence -- for example, from 70 to nearly 500,000 square miles in the case of the Marshall Islands in the South Pacific. Countries that cannot themselves exploit the vast EEZ can "rent" it to other nations for fishing or other uses. The role of CAMP in this process would be minimal in most countries but should be explored in detail for certain countries.

Small island countries are particularly difficult from the standpoint of determining CAMP boundaries. Some CAMP authorities would call entire islands "coastal zones" because most island commerce and societal affairs have a coastal connection. Primary authority over the whole of an island seems unrealistic for a coastal program. Therefore, for island, the author prefers a "tiered approach". In this approach, a "tier one" primary coastal zone is defined to include all the transitional areas between land and sea -- wetlands, coral reefs, sea grass beds, estuaries/lagoons, beaches, tidal rivers, and flood plains. A "tier two" secondary zone is defined to include all the areas inland of the primary zone that have linkages to the primary zone and its resources (69). For small islands the whole of the land area might be validly assigned to the secondary zone, which could work well. It is realistic for a CAMP agency to have major authority over the primary zone and secondary authority (review or coordinative) over the secondary zone.

The author believes that calling a whole island a coastal regime and abandoning the concept of a "coastal zone" as a definable and separable entity is tantamount to abandoning any hope of integrated resource management for the coast. To abandon the idea of governing a particular defined coastal zone or segment -- an area -- and instead to try to govern the use of the resources of the country at large, would result in a program that lacks focus and distinctiveness, and particularly, cohesiveness. The narrower the coastal zone or coastal area, the more authority CAMP can expect to gain. The broader it is, particularly a whole country, the less authority it can gain because of the increase in duplication of existing authorities and the resulting vagueness of function.

3.3 Defining CAMP-Type Programs

We use the term "Coastal Area Management and Planning" (CAMP) for the specific purpose of emphasizing two characteristics: 1), the incorporation of both planning and management in coastal programs, and 2), the consideration of whole coastal areas in a single program, rather than singling out one coastal resource or one economic sector. Other terms such as coastal resources management (CRM) or coastal zone management (CZM) may or may not be analogous, depending upon the level of integration and comprehensiveness they achieve. For example, a CRM program may address only selected resources and economic sectors and a CZM program may shortcut the planning process in

favor of immediate management action to control development. Clearly, much of the difference is semantic, but to avoid any confusion about the scope of the subject we are addressing, our preference is to use the most all inclusive, or generic, term--Coastal Area Management and Planning (CAMP).

Recently the term "Integrated Coastal Resources Management" (ICRM) has been used as an alternative name for coastal management. This term appears to be particularly attractive to international environmental policy experts since it highlights the popular concepts of an integrated approach to coastal resources management. The focus on resources management reflects the growing awareness among developing nations that renewable natural resources constitute foundation blocks needed to support economic and social development initiatives (75).

"Coastal management" refers to any governmental program established for the purpose of utilizing or conserving a coastal resource or environment (75). It is a broad term intended to include all types of governmental intervention. Use of the term implies that the governmental unit administering the program has distinguished a special coastal zone as a geographic area apart from the ocean domain and the terrestrial domain (hinterlands). The resources and/or environments to be managed, according to program goals, define the geographic extent of the coastal area or zone. In its simplest form, a coastal resources management (CRM) program could address just one type of resource -- such as coastal fisheries -- or one type of environment -- such as tidal wetlands -- which is not the comprehensive CAMP approach. It is more common, however, for a coastal program to include several types of resources and environments and to include the interest of several economic sectors, which is the CAMP approach.

"Coastal planning" refers to a process of comprehensively studying resources, economic activities, and societal needs, including problems and opportunities in the designated coastal planning area, or coastal zone. A major purpose is to promote compatible economic development. The product is a plan which identifies options for human progress in the coastal area and recommends governmental and private actions to accomplish beneficial and sustainable change; i.e. change that is "...economically sound and socially just and that maintains the natural resource base" (59). Depending upon the degree of comprehensiveness and multi-sectoral integration involved in the program, the planning function of the program may be either limited or extensive in area and subject matter.

A key factor that distinguishes CAMP-type programs from others is that coastal waters and coastal lands are addressed <u>together in a single unified program</u>. A coastal zone or integrated coastal resources management program has the following six attributes according to Sorenson <u>et al</u>. (75):

1. It is initiated by government in response to very evident resource degradation and multiple use conflicts.

2. It is distinct from a one-time project; it has continuity, and is usually a response to a legislative or executive mandate.

3. Its geographical jurisdiction is specified. It has an inland and ocean boundary -- with the exception of small unpopulated islands which often have only an oceanward boundary; because it is <u>not</u> an ocean management program it must have both shore and landward components.

4. A specific set of objectives or issues is to be addressed or resolved by the program.

5. It has an institutional identity -- it is identifiable as either an independent organization or a coordinated network of organizations linked together by functions and management strategies.

6. It is characterized by the integration of two or more sectors, based on the recognition of the natural and public service systems which interconnect coastal uses and environments.

While this description is appropriate for programs with a management emphasis (CZM type programs), it fails to fully emphasize the broad planning activities characteristic of full-scale CAMP type programs.

Ocean management is not the focus of CAMP, but in some countries ocean management and CAMP may be brought closely together (e.g. Brazil). Ocean management is usually a national enterprise, conducted as a multi-agency, multi-sectoral, initiative. Issues of greatest concern include shipping, offshore fisheries, mineral exploration and development, oceanic pollution control, and ocean research. Recent agreement on the "Law of the Sea" regime has stimulated many initiatives in national ocean management. These may in turn enhance CAMP-type programs as ocean concerns are felt along the land/ocean interface. Sweden, Sri Lanka, and Brazil appear to exemplify this trend (44).

3.4 Objectives of CAMP Programs

The overall objective of the CAMP-type program is to provide for the best long term and sustainable use of coastal natural resources and for perpetual maintenance of the most beneficial natural environment. In practical terms, example purposes may be

identified as supporting fisheries, protecting the community from storm ravages, attracting tourists, promoting public health, or maintaining yields from mangrove forests. All these require coordinated community action for their accomplishment, a need that CAMP fulfills.

Some of the management functions that are needed to accomplish the above purposes are listed below:

- Facilitation of sustainable economic growth (aquaculture, tourism, fishing, non-polluting industry).

- Conservation of natural areas, resources and critical habitats (wetlands, coral reefs, endangered species habitats, etc.).

- Control of pollution.

- Control of site alteration in adjacent shorelands (landfill, land clearing).

- Control of beach front alteration (removal of dunes, excavation of beach sand).

- Control of watershed activities (clear cutting, dams, cropland clearing, urban construction, etc.).

- Control of excavation/mining, and other alteration of coral reefs, water basins, and sea floors.

- Rehabilitation of degraded resources (coral reefs, mangrove forests, estuaries, beaches, etc.).

In Table 3.1, Healy and Zinn (39) list numerous concerns that have been addressed by more than 30 states participating in the U.S. coastal zone management program during its first 10 years (1973 - 1982). This was accomplished by screening 1,044 reports and studies produced by or for state coastal agencies. Although there is some ambiguity and overlap in the terms, the list gives a good indication of the scope of the U.S. coastal program.

In another example, the following problems have been identified by the Philippines Government as those to be addressed in a CAMP type program [56]:

- Natural resources degradation: a) beach erosion; b) conversion of mangrove swamplands into other land uses; c) landfill or reclamation of foreshore areas; d) dynamite fishing; e) overfishing; and f) overexploitation of mangrove forests.

Table 3.1. Environment and development concerns in coastal management (number of citations out of possible 1,044) (Source: ref. no. 39)

Development concerns		Environment concerns		Environment/development interactions	
Recreation/tourism	140	Coastal resources	118	Erosion/sedimentation	90
Petroleum industry	65	Wetlands	103	Environmental impact	38
Energy facility siting	65	Fish/fisheries	85	Conflicting uses	36
Facility siting	62	Public access	82	Floods/flooding	34
Ports/waterfronts	58	Critical areas	48	Oil pollution/effects	29
Energy	45	Vegetation	47	Energy impacts	21
Transportation	43	Marine biology	46	Pollution	17
Industry/commerce	42	Wildlife	46	Water pollution	13
Population	29	Water quality	44		
Dredging	29	Beaches/dunes	36		
Marinas	28	Water resources	35		
Boating	25	Estuaries	34		
Growth	22	Aesthetics	28		
Shipping	18	Resource protection	22		
Agriculture	18	Living marine resources	21		
Water development projects	14	Cultural/historical resources	12		
Navigation	14	Groundwater	10		
Oil and gas	14	Barrier islands	8		
Marine mining	9	Open space	7		
Coal transportation/storage	9	Preservation	5		
Energy transportation/storage	9	Coral reefs	4		
Forestry/logging	7	Air resources	3		
Waterfront development	7				
Aquaculture	6				
Total	778	Total	844	Total	278

- Pollution: a) industrial sources (industrial waste); b) domestic sources (household wastes and solid wastes); c) agricultural sources (pesticide and fertilizer runoff); and d) other sources (dredging activities).

- Land use conflicts: a) absence of access to foreshore lands due to human settlements encroachment; b) unusable beach areas due to excessive pollution; and c) conservation and preservation of mangrove areas versus conversion of the same into fishponds, or reclamation of the same for human settlements and commercial purposes.

- Destruction of life and property by natural hazards: a) flooding due to storms; b) tropical cyclones; c) earthquakes; and d) tsunamis.

A major purpose of CAMP-type programs is to examine proposed major development projects to determine the impacts they have on coastal resource systems and to recommend design or locational changes which can eliminate or reduce any negative impacts. This regulatory function will usually require some form of "environmental assessment" type of fact finding procedure. If the impacts are eliminated or reduced to a minor level or if they are appropriately "mitigated" (i.e. offset by compensatory activity such as environmental enhancement elsewhere on or off the development site) the proponent of the project will be granted development permission. Over time, experience gained with different kinds of projects and different resources will raise the level of confidence of the CAMP program and actually enable it to facilitate development by providing useful strategic guidance to coastal communities and to development interests.

Another important purpose of CAMP programs is to resolve problems of resource use by identifying issues that arise over conflicting coastal activities and finding methods of conflict resolution that are fair and just. This is a crucial part of a CAMP program because conflicts that arise over coastal environmental and resource issues can be severe, including loss of life (e.g. the Indonesia fishing "wars" of the 1970's) and destruction of property (e.g. a riot of 50,000 people and sacking of a tantalum factory, Phuket, Thailand, in 1986 (41). Methods for resolving conflicts include: fact finding and executive decision, study commissions, bargaining sessions, informal negotiation, formal mediation, administrative or public hearings, and adjudication. Any appropriate method can be included in the CAMP management framework.

CAMP is focused mainly on maintaining the natural resource base of the coast through planning and management actions. There is danger in expanding the CAMP program into areas of

jurisdiction that are already occupied by other governmental authorities: for example, while CAMP programs do address fish habitat nursery areas and water quality of fishery areas, they would not usually address fisheries operations such as controls on harvesting (e.g. quotas, sizes, closed seasons, gear type, etc.). Because these functions typically involve only the fishery sector, they are handled separately from CAMP which addresses itself to multiple-sector concerns.

3.5 CAMP as a Regional Process

To be successful, CAMP has to be a distinct process focused on distinctive issues. Its goals must be clear and unambiguous. CAMP should be seen as a process to improve development planning and resource conservation at the regional level. It should not be seen as a new approach to fishery management or maritime administration or a substitute for coastal forestry or agriculture programs. CAMP is a planning and coordinating process which deals with development management for coastal resource systems and whose focus is on the land/water interface.

CAMP programs involve a strong central government role for many reasons, not the least of which is that central government typically retains most jurisdiction over coastal and ocean waters (Figure 3.2). Nevertheless, CAMP programs can operate at a subnational level; in fact, many countries will find that the most effective program is one that recognizes the distinctiveness of resource programs in various coastal regions of the country and focuses on regional, rather than national, solutions. This approach should be feasible in countries with a tradition of regional development planning, by means of which coastal resource management can be considered concurrently with economic and social development needs. Then a balance can be struck between short term payouts and the long term benefits of management for sustainable use of natural resources. A major advantage is that regional planning is strategic and it considers a multiplicity of factors before recommending the feasibility of particular development projects. CAMP programs that utilize regional approaches in the planning phase will be greatly enhanced in the management phase.

3.6 Premises and Principles of the CAMP Process

The CAMP process is recent and its application is still at the experimental level for the most part. Therefore, much of this book deals with theory rather than experience. While CAMP concepts are similar to some concepts of terrestrial resource management and planning, they are quite different from others. CAMP is based upon fundamental premises and principles that have not, so far, been fully articulated in the literature. We have assembled here a listing of those we consider to be the more important ones, as we understand them, with a discussion of the

role of each in CAMP-type programs. Some of the premises and principles presented below are specific to coastal and/or aquatic areas, while some are of more general application to renewable resources conservation programs. While the degree of specificity to CAMP is self-evident for the most part, we have arranged the list so that items more specific to CAMP appear toward the beginning of the list and those of more general application toward the end.

1. <u>The coastal area is a unique resource system which requires special management and planning approaches</u>.

The place where the land ends is also the place where the knowledge and experience of most administrators ends. Planners, managers, engineers, and politicians alike are usually not well informed about the sea and the sea coast. Those who do have knowledge are usually experts in particular subjects--navigation, fisheries, science, or hydrodynamics -- who know the sea and seacoast from a specialist's point of view rather than from a systems perspective. Those few who have prepared themselves to know the sea and seacoast as a natural system and who understand the interactions of sea and coastal land, are exceptionally important to CAMP programs. Only recently has formal graduate level training been available to those who would choose to make CAMP a career. CAMP is recognized as an interdisciplinary pursuit, not as a distinct discipline.

The sea remains inscrutable, and mysterious for most of us. On land we can see the effects of our activities and we are constantly reminded of the need for action, but for the sea most of us see only the surface. Not only are we less aware of our impact on submerged life, but the subject is most difficult to investigate. This applies not only to the vast reach of the deep ocean, but also to the inner reaches of the coast and its estuaries and lagoons, where seagrass meadows and mangrove swamps are evident, but their functions still unknown to most people. That people cannot easily see what happens underwater, creates a special burden for marine conservationists.

The major resource systems of the coast have no equal on land. Coastal ecosystems and key coastal habitats -- such as coral reefs and mangrove forests -- are not only distinctive, but extremely productive of renewable resources. Clearly, traditional land-based or marine-based forms of management and planning must be modified to be effective for the coast, at the transition between land and sea.

From the natural sciences point of view, the coastal area is an extremely complex, highly diverse, and complicated system; a complexity that ensures a continuing high need for help from scientists in the coastal planning sphere. From a planner's

viewpoint, the coast is a place with an inherently incomplete database and where major influences -- e.g. storms, erosion, fish migrations -- are usually unpredictable and where land based planning principles are irrelevant.

Seafood is recognized as a critically important resource (8); it provides more protein worldwide per capita (16.1 lbs.) than beef and mutton combined (12.2 lbs). Yet economic planners take slight notice, perhaps because seafood production is a mysterious pursuit carried out far from cities and incomprehensible to most persons. Also fisheries are variable and, in large measure, unpredictable and unprogrammable.

Some of the most difficult resource conflicts of the coastal zone arise from conversion of coastal lowlands from natural habitats to agriculture uses. To the upland economic planner it may seem logical to drain and plant the lowlands and wetlands, until he discovers that the potential of soils in coastal lowlands is usually quite low because peaty conditions cause acid-sulfate soils and because there is a high incidence of flooding. One must be very cautious with mangrove swamp or brackish transition swamp/marsh conversions to agriculture. For example, Burbridge and Stanturf (13) see agriculture on the Southeast Asian coast as a risky business, particularly in making careful decisions about using soil sites that require continuous high levels of management to achieve socio-economic benefits. Also, lowland/wetland developments have potentially harmful side effects; e.g. the release of agricultural chemicals into riverine and coastal waters, or the destruction of valuable

No realistic amount of investment can overcome the natural forces which have created these lowland/wetland areas or the natural hazards which will continue to influence their use. And there is also a danger that hazards such as periodic flooding will be exacerbated by poor management of clearing and draining in coastal lowlands leading to flash floods. Such floods pose serious risks to farmers (13) and can overwhelm estuary or lagoon with pulses of sediment, organics, and chemical pollutants.

Another example of special CAMP problems is urban waterfront development, which is both vital to coastal cities and threatening to coastal resources. High quality shorefront land parcels are in high demand, particularly those that extend to and/or across the intertidal zone and carry such values as ship berthing, access to fishing, access to the beach for tourists, and unobstructed view of the sea from home or apartment. With such demand for sites at the water's edge, the development planning context tends to narrow to a linear approach; that is, it focuses on the Mean High Water line and the properties that lie along that line.

Because coastal land is so scarce, it may have to be allocated in a different manner than other land in order to keep options open for future high priority development. For example, in the United States "non-waterfront dependent" uses of waterfront land are typically discouraged and usually denied if negative environmental effects are predicted (by exercise of state CZM or Federal permit authority).

Because of the extreme scarcity of good shorefront land and its importance to coastal communities, both centrally planned and free market countries have reason to allocate coastal land uses within a broader social perspective than ordinary land and take a longer term, more comprehensive and integrated approach, one that includes conservation and social equity needs as well as economic growth objectives.

As these few examples show, the special characteristics of the coastal area require special planning and management approaches, such as those found in CAMP-type programs, approaches which anticipate and deal with unusual problems and the unique conflicts that arise along the coast. It is clear that those who work with CAMP programs should have special training and experience.

2. <u>Water is the major integrating force in coastal resource systems.</u>

Every aspect of a CAMP program relates to water in some way, requiring the creation of unusual and sometimes complex institutional arrangements. Water provides the economic base and the gestalt for coastal communities. It provides beaches and viewscapes and gives rise to traditions of fisheries and maritime shipping. But water also erodes beaches and floods coastal cities in response to storm events.

Virtually all of the water of interest to CAMP is moving water; it is either oscillating with the tides or running down from the land in rivers. Ocean currents bring salty waters from the ocean to mix with fresh water from the land along the open coast or in lagoons and estuaries. In humid coastal areas where extensive fresh water discharge dilutes seawater, salinity level is a principle determinant of the type and abundance of species that are present.

Being at "sea level" elevation, the coast is the eventual receiving basin for all land runoff water and the wastes it carries. Consequently, a large share of the world's pollution ends up in coastal lagoons, estuaries, wetlands, submerged grass beds, and coral reefs. Coastal discharging rivers not only bring pollution, they gather and bring rampaging flood waters into the coastal plain.

In summary, because it operates at the water/land interface, every aspect of CAMP relates to water in one way or another, whether making provisions for marine commerce or the ravages of seastorms, or resource conservation, or pollution abatement. The water influence not only establishes special conditions, it also dictates unusual and complex institutional arrangements. In most countries a great variety of agencies have interests in coastal waters, interests that are sometimes complementary but more often competitive. The value of a CAMP program is that it can serve to coordinate all the varied interests in coastal resources and coastal development.

3. <u>It is essential that land and water uses be planned and managed in combination</u>.

The CAMP process recognizes coastal shorelands, lowlands, intertidal areas, lagoons, and open waters as a single interacting and indivisible resource unit that lies between the upland and the open sea and whose future must be planned and managed in combination. Ecologically, any uncontrolled development activity located anywhere near coastal areas -- in watersheds, floodplains, wetlands, tidelands, or water basins-- has the potential for damage to the coastal waters ecosystem.

The land can strongly affect the sea. Impacts on coastal ecosystems include: industrial and agricultural pollution; siltation from eroded uplands; filling to provide sites for industry, housing, recreation, airports, and farmland; dredging to create, deepen, and improve harbors; quarrying; and the excessive cutting of mangroves for fuel. In many parts of the world, the construction of dams has blocked the passage of marine species migrating from inland spawning sites. The habitats of many other aquatic animals also are threatened; for example, sea turtle nesting beaches have been encroached on by roads, housing and other developments. As fisheries become more important for food and income, the effects of pollution from the land and physical destruction of their habitats become more crucial, particularly for those species depending on coastal wetlands and shallows for spawning grounds and nurseries.

Conversely, the sea can strongly affect the land. For example, beaches, mangroves and coral reefs are extremely important for protecting shorelines and coastal villages against storm waves and shore erosion. An example is Sri Lanka, where the mining of coral reefs to produce lime was so extensive before a CAMP program was initiated that a local fishery collapsed; mangroves, lagoons, and coconut groves were lost to shore erosion; and local wells became contaminated with saltwater.

These linkages between the "dryside" and "wetside" of the coast -- that is, between the terrestrial and the marine realms-

- precludes the effective management of a marine or estuarine resource system without concurrent management of adjacent land habitats. Therefore, the proposition that coastal ecosystems include both dryside (land) and wetside (water) components and that they should be managed together is considered fundamental. Development planners must recognize, particularly, that modification of the land area (e.g. land clearing and grading) has a high potential for adverse effects on lagoon or estuarine coastal systems. It follows that CAMP must address land modification activities, principally those associated with site preparation for development (26).

In summary, the CAMP process recognizes as a first priority that the coastal lands and the coastal seas must be considered as an interacting and indivisible unit. This emphasis on the land/water interface of the seacoast and its particular influences makes the CAMP process unique in the realm of integrated planning and management.

4. <u>The edge of the sea is the focal point of coastal management programs</u>.

Although the coastal zone may be drawn broadly or narrowly, it always includes the water's edge -- the boundary line between land and sea that includes the intertidal and supratidal zones. This is where authority changes abruptly, where storms hit, where waterfront development locates, where boats make their landfalls, and where some of the richest aquatic habitat is found. It is also where typical terrestrial type planning and resource management programs are at their weakest. The edge zone includes coastal floodplains, mangroves, marshes and tideflats, beaches and dunes, and fringing corals. It is a place of great dynamism and energy.

The water's edge is also the place where the greatest competition and conflict between users is found and where governments need to develop the type of special policies and programs that CAMP offers. Experience with developing CAMP type programs in several countries indicates that while the policy and planning agenda may cover a wider coastal zone, the operating program itself will usually target the narrower edge zone. In the first regional CAMP program in the United States -- which was for San Francisco Bay -- authority was granted to a regional coastal commission (Bay Conservation and Development Commission) for a zone width of only 100 feet, extending shoreward of the water's edge (Mean High Water). In another example, the CAMP program for Washington State covers only 200 feet of the edge zone. Such narrow zones were possible because in the United States numerous other Federal and state laws control actions in the intertidal area and near coast waters seaward of the edge zone and in the shorelands landward of the edge zone. The Sri Lanka CAMP program has authority over a zone that extends from

300 meters landward of the mean high water line to one kilometer seaward of the mean low waterline; the landward boundary may be extended to a maximum of two kilometers inland where rivers, lagoons, or estuaries occur (15).

From a strategic and political perspective, success in creating a national CAMP-type program may come more easily if the zone for management is narrow than if it is wide. A mandate to manage a narrow strip of transitional area comprised of mostly tidally influenced habitats, may win approval more easily than a broader zone including deeper parts of the sea and higher and dryer parts of the shorelands. As pointed out in the next subsection, it is the coastal common property resources of the "wetside" that are emphasized in CAMP rather than the private property of the "dryside". These resources can be adequately managed by a program that gives priority to the edge zone.

5. The emphasis of coastal resources management is on common property resources.

While planning and management strategies may of necessity include control on use of private lands and private activities, a major purpose of CAMP is the caretaking of coastal common property resources of the wetside, such as coastal waters, coral reefs, or mangrove forests. Management of common property is an important function of government and one that often gets too low a priority; as stated by J. Gritzner (35), "...neglect of common property issues is often a principal cause of failure in development projects...".

The resources of primary concern to CAMP are at the edge of the coastal sea, in lagoons and estuaries, and in the transition zone of beaches, mangroves, and tideflats. In most countries these places ar not owned by individuals or private entities, but are "commons" where the public has more or less free access and use. Therefore, the resources of coastal areas are the responsibility of governmental agencies. Depending upon traditions and circumstances, jurisdiction may be shared in any combination of entities: national government, state or provincial governments, tribal chieftains (in some South Pacific countries) and so forth.

The edge zone of intertidal and shallow areas may the most ignored part of the coastal commons and the one in most need of management through CAMP programs. Therefore, in the CAMP planning phase, a priority should be given to understanding the use, jurisdiction, and issues concerning these edge zone resources (see preceding section).

6. <u>Prevention of damage from natural hazards and conservation of natural resources should be combined in CAMP programs</u>.

The CAMP-type program is the best vehicle for combining coastal natural hazards prevention and resources conservation. As many experienced planners and managers already know, the measures best suited to conserving ecological resources are often the same as those needed to preserve the natural landforms that serve as barriers to storms and flooding. In addition to their ecological values, such coastal resources as reefs, beaches, dunes, and mangroves form important natural defenses against wave action. Reefs act to "trip" storm waves, reducing their strength as they pass over the shallow depths. Beaches and their dunes and offshore bars are also efficient dissipators of wave energy. Where beach sand is deposited in bars offshore, water depth is decreased and storm waves break farther from shore; if the sand is deposited landward (in dunes) the effective width and volume of the beach is increased, further reducing the danger of severe loss of beach to destructive waves.

A leading example of the use of CAMP for hazards prevention is the Sri Lanka program which was motivated by coastal erosion and storm damage caused by mining of coral reefs (see Box 3.2).

Water related disasters are virtually inevitable in any coastal nation. They result from cyclonic storm attack, tsunamis, shore erosion, coastal river flooding, landslides and mudslides, and soil liquefaction. It is usually neither economically feasible to eliminate the hazards through engineering (e.g. by building giant seawalls), nor to exclude all people and structures from the hazard zones. Most societies have developed administrative and social mechanisms to cope with the aftermath of extreme natural events (post-disaster relief). However, <u>prevention</u> of the same type of hazards is often ignored and thus development processes which increase the level of coastal hazards are free of control. This would appear to be a situation which should be remedied when one considers the high loss of life and property from natural hazards (e.g. an average death toll of 34,360 persons per year just from cyclonic seastorms, reported by the Swedish Red Cross for the 1970's).

The Philippines, Bangladesh, St. Lucia, and dozens of other countries are affected by serious storms and flooding. This risk, and that from other hazards could be lessened through controls on type, density, and location of settlement through initiation of effective CAMP programs. Of particular importance in such programs is the maintenance of natural landforms that take the brunt of storms and therefore protect lives and community structures.

Box 3.2

Sri Lanka's Coastal Zone Management Plan

Sri Lanka's Coast Conservation Department (CCD), the nations's lead agency for coastal zone management, has recently completed a draft of its first legislatively mandated national Coastal Zone Management Plan (CZMP), culminating four years of intensive work. The CZMP focuses on three national priorities:

- erosion management
- loss and degradation of coastal natural habitats
- protection of scenic areas and cultural and religious sites.

The CZMP, which was developed in close coordination with other Sri Lankan agencies concerned about and responsible for coastal resources represents the best available analysis of the nation's coastal problems. In addition, it provides both a policy framework and a practical strategy for dealing with the problems.

Management strategies, which include regulation, research programs, enhanced intergovernmental coordination and public education, are presented for each priority issue. For example, the erosion management strategy establishes a setback line to ensure that structures are not sited so close to the shoreline that they contribute to or are affected by erosion.

Regulatory measures prohibit the construction of shoreline protection work in some geographic locations, while they establish review procedures for constructing such structures along the rest of the coast. In addition, coral and sand mining are regulated. Both activities accelerate the rate of coastal erosion in areas with already serious erosion problems. Also included in the erosion management strategy are: a public education campaign targeted at coral and sand miners regarding the impacts of their activities, a program to identify alternative employment for displaced coral miners, and a research effort to identify alternate sources of lime for the building industry. Complementing these management efforts is a public investment program to build shoreline protection works in appropriate areas.

Source: S.Olsen (Reference No. 63)

Because officials responsible for coastal hazards concern themselves mostly with emergency response and post-disaster relief, the condition of the coast's protective resources has been largely ignored. That is why it is essential for CAMP to undertake a primary role in prevention. Also conservation of the physical natural defenses of the coast is a logical counterpart to conservation of natural habitats. The mutuality of interest suggests that in some countries, agencies responsible for prevention and mitigation of natural hazards should become just as interested in advancing CAMP programs as are the agencies responsible for resource conservation and environmental protection.

Embracing the dual goals of conserving coastal resources and maintaining nature's hazard protection systems can save money. Because of the link between uncontrolled development and disasters, an important aim of CAMP is to integrate the knowledge of coastal hazards and risks into developemnt standards and planning guidelines. Specific guidelines for estimating the hazard risk level of a project or program should be applied to every development proposal. This would insure that projects do not unnecessarily increase risk and, further, that they can be implemented in a way that reduces existing hazard risks and is cost effective. An example worth studying is the massive runoff from rainstorms associated with a major "El Niño" event in 1983 which caused high property damage at the Ecuador coast and also disabled much of the aquaculture industry.

In summary, fully comprehensive CAMP programs include both natural hazards prevention and coastal resources conservation (75) using similar methods to accomplish both objectives.

7. Coastal management boundaries should be issue based and adaptive.

There is no single description of "coastal area" or "coastal zone" for the CAMP process; boundaries are delineated on the basis of the particular problems that CAMP attempts to solve. The boundaries must be adaptive to the goals and objectives of the CAMP process.

The CAMP zone of jurisdiction is based on political and administrative considerations as well as economic and biogeographic ones (73). It would be valid to include in the coastal zone all areas that have an influence on coastal waters; but this definition would encompass all coastal plains and the watersheds of all streams and rivers that drain into the sea, which at times extend hundreds of kilometers inland. On the other hand, it might also be valid under certain circumstance to set the seaward CAMP boundary at the edge of the continental shelf (at a depth of 200 meters). Within these extremes falls the area usually delineated as the CAMP planning zone -- the transitional

strip of land and sea that straddles the coastline including the narrow edge zone of mostly intertidal habitats. This strip contains some of the most biologically productive and economically valuable habitats of the biosphere, including estuaries, coastal wetlands, and fringing coral reefs. But it must be recognized that this area also contains dense human populations and undergoes great environmental modification and deterioration through landfill, dredging, and pollution associated with urban, industrial, and agricultural development.

Use of the term "coastal area" (as in CAMP) or "coastal zone" (as in CZM) indicates that the governmental unit administering the management program has distinguished a coastal area or zone as a geographic area apart from -- yet between the oceanic domain and the hinterlands (the terrestrial or uplands domain). According to Sorenson et al. (75), boundaries for integrated coastal management programs should be tailored to capture, and enable resolution of, all the major coastal issues. Because there is a broad array of possible coastal issues, there is a broad array of possible CAMP management boundaries. Some boundaries are quite narrow, and are best suited to deal with use conflicts occurring at the immediate shoreline. But if watershed generated impacts are serious, then a coastal management boundary extending inland to the ridge line of the watersheds that drain into coastal waters would be justified.

Thus the habitats, species, and other resources under the purview of CAMP planning processes would include the areas from a defined upland limit downslope, or through lowland, dunes, and floodlands to estuaries, swamps, beaches, shallow waters, and perhaps even extend to include the smaller coastal islands. In the open waters, the management program should focus on shallower nearshore coastal waters, but it could in some cases extend to the outer edge of the continental shelf or even to the boundary of the "Exclusive Economic Zone" (200 miles offshore).

Where it is convenient to subdivide the coastal zone into tiers for varying types of management, the "marine and coastal waters" tier (wetside) should be adjusted to reflect fisheries and port sectors, the importance of nearshore spawning and nursery habitats, and regional and international matters. The "edge zone" or "transitional area" tier (wetside) should address shallow water and intertidal areas while the "shoreland tier" (dryside) should address coastal development and storm flooded areas. The "upland tier" (dryside) should address watershed problems.

In summary, the geographical jurisdiction of CAMP is variable but the CAMP program will be most effective when its geographic scope is most limited. The CAMP zone has both inland and ocean boundaries. Small islands would be included in toto so long as they were within the CAMP oceanward boundary. Given the

environmental, resource, and governmental differences among coastal nations and subnational units (provinces, towns) there is considerable variety in the selection of boundaries to delineate both seaward and inland extent of the CAMP zone. Ideally, a coastal nation or subnational unit should set the boundaries of the CAMP zone only as far inland and seaward as necessary to achieve the objectives of the management program. Since the problems and opportunities that motivate the creation of a CAMP program vary considerably from one unit of government to another, the selection of boundaries would also be expected to exhibit considerable variation among coastal nations as well as among subnational units (75).

8. <u>All levels of government within a country must be involved in coastal management and planning</u>.

Coastal resource management requires involvement by all levels of government. The local governments are involved because they govern where development takes place, where resources are found, and where the benefits or disbenefits are mainly to be felt. The central government has to be involved because responsibility and authority for marine affairs inevitably rests there (navigation, national security migratory fish, international relations, etc.). Intermediate levels of government -- e.g. state (provincial) or regional -- are involved because all entities which have responsibility in the coastal area have a role in the CAMP process.

Coastal areas are governmentally complex and require a high level of intergovernmental coordination. Some of the reasons are given below:

- The amount and complexity of public interests in coastal areas is high;
- the effects of conflicts and impacts of one sector on another that require government intervention is exceptionally high;
- there is considerable involvement with public (common property) resources and their conservation;
- water is a fluid resource which is not containable or ownable in the usual sense, and which simultaneously effects all coastal interests;
- a greater variety of coordinated multi-governmental policy decisions is required in coastal areas; and
- there tends to be a high level of international interest in coastal matters.

The immediate shorelands (the "dryside" of the coastal zone) are usually subject to more local or provincial government control and less central government control. However, non-development zones that exclude most private use may be imposed by central government to prohibit private encroachment into wetlands or beaches, or to guarantee unrestricted public access to the public resources of the shore (75). An example is Costa Rica where much of the mangrove coast is protected (17).

For the marine and transition areas (the "wetside" of the coastal zone) central government authority is prevalent. In the intertidal zone -- wetlands, tidal flats, beaches -- the "public trust" is often strongly asserted, which, in turn, invokes central government control. Central governments usually act as the "trustees" of the common (public) property of coastal areas.

For the uplands, or hinterlands, the practice in most nations is to exercise even less control than for coastal areas. Exceptions may be found among nations with strong programs for land use planning or town and country planning (e.g. Great Britain) or nations with strong centralized economic development programs (75).

By comparison, most social policy areas (e.g. criminal justice, public education, and health care) involve relatively fewer government sectors than coastal management. The greater the number of sectoral divisions within a policy area (such as CAMP) the greater the potential for fragmentation of governmental responsibility and duplication of effort.

In summary, coastal areas and coastal resource systems are governmentally complex because of the degree of shared jurisdiction and the amount of common property resources involved. Therefore, CAMP activities need to involve all levels from national to village governments.

9. <u>The nature-synchronous approach to development is especially appropriate for the coast</u>.

The most cost effective approach to coastal development and coastal engineering is one that respects the strength of natural forces operating at the coast and that designs projects to utilize or adapt to these forces -- this is the "nature-synchronous" or "design with nature" approach (50).

Countries with limited investment capital and a critical need for food and economic betterment cannot afford to waste their money on overly expensive or ineffective structures. Yet this has happened too often with projects engineered to defy natural forces and ecological processes. Natural forces are exceptionally strong in coastal areas -- wind, waves, erosion, storm surges, and tides. The beachfront is a place of

extraordinary release of natural energy and a place where mistakes can be very costly. Special risks are attached to development on the ocean beachfront, where buildings are directly in the path of storm-driven waves.

Beaches and dunes shift with changes in the balance between the erosive forces of storm winds and waves, on the one hand, and the restorative powers of tides and currents, on the other. Consequently, along much of its length, the coast is a risky place to maintain habitation. The costs in property losses and human lives have been high. Furthermore, enormous sums of public money are spent on "hard engineering" efforts to stabilize and safeguard beaches. These efforts are rarely rewarded with success.

There is another approach -- nature-synchronous engineering or "soft engineering" -- which offers a more cost-effective alternative to "hard engineering" and that works well in many, but not all, situations.

For beach projects, the soft engineering approach recognizes that the natural beachfront exists in a state of dynamic tension, continually shifting in response to waves, winds, and tide and continually adjusting back to an equilibrium state. Long term stability is gained by holding the slope or profile of the beach intact by balancing the sand reserves held in various storage elements -- dune, berm, offshore bar, and so forth. Each component of the beach profile is capable of receiving, storing and giving sand, depending on which of several constantly changing forces is dominant at the moment. The storage capacity of each of the components must be maintained at the highest possible level. This can be facilitated in some cases by proper design in locating wave absorbing structures (rip-rap) rather than wave reflecting structures (concrete bulkheads).

Many applications of nature-synchronous engineering approaches for beach stabilization can be cited. For example, harbor inlet stabilization, dune management, and beach replenishment. There are other applications such as vegetated stormwater drainage ways and buffer strips (instead of concrete ditches), mangrove buffer strips along channels (instead of bulkheads), and retention of flood plains to store flood waters (rather than concrete storm water canals). Most soft engineering approaches have less damaging impact on coastal renewable resources than hard approaches.

In summary, in both planning and in management (project review/environmental assessment) phases, preference should be given to nature-synchronous options.

10. Special forms of economic and social benefit evaluation and public participation are required for coastal management programs.

Because numerous economic sectors are influencing the coastal area, one must examine the economic "externalities" of each. When any one sector attempts to gain the highest economic yield from its activities, it often attempts to avoid responsibility for its external effects. For example, a factory operator may wish to avoid financial responsibility for the degradation of fisheries or inhibition of tourism caused by his factory wastes polluting a bay. The CAMP process examines the effects of "externalities" of any one sector on other sectors, most importantly the effects of "dryside" (shoreland) private activities, upon the common resources of the "wetside" of the coastal area.

Burbridge (11) points out that it is difficult to assess ecosystems adequately using economic techniques normally used in project planning. First, many of the goods and services produced by these systems in their natural state are not easily expressed in cash terms, and second, many of these goods and services are harvested "offsite"; that is, they are external to the discrete biophysical system and become economic externalities within adjoining systems. The absence of quantifiable market values for many "environmental" goods and services does not present an insurmountable problem because qualitative assessments of their significance can be incorporated into a carefully constructed analysis (11). However, while some factors can be quantified (e.g. expected changes in income levels), others are not quantifiable (impact upon traditional lifestyles). Both types of effects should be researched and brought together with other relevant information as part of the package of factors to be considered.

Burbridge notes that there are two broad considerations concerning human resources. The first is assessing the negative or positive impacts of development programs and projects on the people who will be affected. The second concerns consultation with these people in the project formulation, planning and implementation processes (11).

International donor agencies normally have some broad social objective in stimulating development. Therefore, a more broadly based assessment of projects and the ecosystem framework within which they operate is required, one which expresses a development project's impact upon society as a whole. Factors that are often excluded from financial analyses -- such as the costs imposed by pollution -- should be considered by donor agencies and project planners in an economic analysis (11)

CAMP programs require the highest level of public participation possible or appropriate (Box 3.3). People who live along the coast and have traditionally used coastal resources may be greatly affected by new rules and procedures. Therefore they must be involved in the formation of new coastal policies and rules on resource use, if they are to support them. In answer to the question, "Why should local communities support sustainable and ecologically sound uses?", Alan White (83) answers as follows: "Traditionally, these communities understand the limits to natural marine ecosystems and productivity, but in our modern, over-populated world, this tradition is being lost." White (83) develops the argument further in the following statement about support for coastal parks and protected areas:

> Education and good examples (pilot projects) can show and remind people what is possible in terms of sustainable use and the value of protected areas. But education is not participation. Participation comes from wanting to support common values to gain some real or perceived benefit for the individual and community. Without it, marine resources can never be conserved and sustained because "enforcement" of laws in such a commons is not practicable. When people decide to "participate", they as resource users will make the real difference in protected area management. The solution thus lies in helping people to decide to participate in a constructive manner. Once resource users decide to do so and receive the associated benefits, the process will perpetuate itself.

11. <u>Conservation for sustainable use is a major goal of coastal resources management</u>.

An important CAMP premise is that coastal renewable resources should be managed to produce benefits on a long term, sustainable, basis. Sustainable use is the alternative to resource depletion that accompanies excessive exploitation for short term profit. A corollary is that development projects should be designed to sustain themselves without continued subsidy. According to Burbridge, there are <u>both</u> biophysical and socioeconomic factors involved in determining the levels of reasonable resource exploitation levels (11). This involves conscious economic choices by individual societies on the allocation of scarce capital, manpower and technology. Recently there has been a shift in political reasoning away from exploitive, non-sustainable uses, which are expensive in terms of management costs and risky in terms of the foreclosure of future development options. In the CAMP process the priority is given to resource uses that are sustainable.

As explained by Snedaker and Getter (73), in most parts of the world, renewable coastal resources tend to be economically limited. Over time, the economic demand for a given resource will

commonly exceed the supply, be it arable land, fresh water, wood or fish. Sustainable use management ensures that renewable resources remain available to future generations. The criterion for sustainable use is that the resource not be harvested, extracted or utilized in excess of the amount which can be produced or regenerated over the same time period. In essence, the resource is seen as a capital investment with an annual yield; it is therefore the yield that is utilized and not the capital investment which is the resource base. By sustaining the resource base, annual yields are assured in perpetuity.

The difficulty of sustainable use management -- or conservation of coastal resources -- rises year by year because of increases in coastal populations, desire for foreign exchange earnings, the availability of technology, and so forth. Restrictive allocation of the resources of the coastal commons tends to come only after excessive exploitation causes serious depletion of resources and resulting shortages of food and materials or social conflicts. However, some coastal communities have solved this problem by traditional management mechanisms and consequently are ensured of sustained yields of seafood and other coastal products. CAMP-type programs encourage the continuance of effective traditional management systems operated at the local level (see Principle 14).

In summary, CAMP programs are founded on the proposition that renewable resource systems must be managed to provide a sustainable level of output.

12. <u>Multiple-use management is appropriate for most coastal resource systems</u>.

Exclusive use of particular coastal resource units for a single economic purpose is discouraged by CAMP in favor of a balance of multiple uses whereby economic and social benefits are maximized and conservation and development become compatible goals. Contrary to some current impressions, conservation and economic development are not conflicting ideas. In fact, well planned, conservation-oriented, development will add to the general economic and social prosperity of a coastal community, while bad development will sooner or later have a negative effect. The simultaneous achievement of development goals and resource conservation goals may require that communities modify some development patterns. However, with innovative management based upon sustainable use, communities may be able to achieve a desirable balance without serious sacrifice to either short term development progress or longer term conservation needs.

As planners sort out the problems, opportunities, and issues of the coastal area, those which most naturally fall under a CAMP program become obvious. The tableau will vary from country to country according to conservation needs, traditions, norms, and

governmental systems. But compatible multiple use objectives should always be encouraged with the goal of strengthening the program, improving its efficiency, and guaranteeing the greatest benefit to coastal communities through equitable sharing of resources.

Program initiation for CAMP is usually in response to a perceived use conflict, a severe decline in a resource, or a devastating experience with natural hazards. Launching a coastal program demands strong motivation. Such motivation can arise from events that dramatize the importance and vulnerability of coastal resources. The potential long term socioeconomic benefits of coastal management must be evident in order for environmental quality and natural area protection to enjoy continued support. Fisheries productivity, increased tourism revenues, sustained mangrove forestry, and security from natural hazard devastation appear to be the four most common and persuasive arguments for CAMP (75).

According to Burbridge (9) the levels of exploitation and methods for management of the goods and services provided by coastal ecosystems varies considerably among individual nations. Factors such as the potential utility of the goods and services, manpower, and market forces play a significant role in the way natural systems are used. The potential benefits that complex resource systems, such as estuaries and mangrove forests, offer to social and economic development depend on maintenance of the functional integrity of these natural systems. They should be developed for a broad spectrum of sustainable multiple uses (see Table 2.2), <u>not</u> converted to any single purpose use. The multiplicity of benefits these natural systems offer is often overlooked because most development plans for coastal areas focus upon maximizing single purpose uses. The management systems usually created are too narrow and generally fail to harness much of the resource potential offered by natural systems. As a result, many opportunities for the improvement of economic and social welfare of coastal people are not developed (9).

A very basic problem is that responsibility for complex natural resource systems is given to agencies which represent only one economic sector. For example, because mangroves are trees, mangrove forests are often made the responsibility of a Ministry of Forestry. While alert foresters may become aware of the value of mangroves in controlling coastal erosion and the importance of mangroves to the conservation of fisheries, their primary responsibility is to develop mangrove forests for wood production. They are, therefore, not normally asked to conduct broadly based environmental and economic assessments of mangrove systems or to develop management plans for sustainable uses other than forestry (9).

In economic terms, the multiple-use concept requires that all actual and potential uses for resource utilization schemes be determined so as to ensure that the sum of the "opportunity costs" is minimal. Opportunity costs represent the value of those lost options (or opportunities) that would otherwise be derived from using other resources, as opposed to committing one resource for an exclusive use. For example, in determining the allocations of fresh water for either irrigation or fishery maintenance, if the use of fresh water is exclusively for irrigation, then this imposes an opportunity cost for fisheries which equals the annual income which could have been obtained but is now lost due to its collapse (e.g. the Egyptian sardine fishery in the Mediterranean and the hilsa fishery in Pakistan). A major advantage in a balanced multiple-use program for a coastal resource is that investment risk is lowered. The multiplicity of uses provides a hedge against failure of any one use of a resource and enables flexibility in face of unexpected change in the market or natural variation in the productivity of the resource.

In summary, the maximum flow of natural goods and services from a coastal resource system can be expected in a multiple-use CAMP approach.

13. <u>Multiple-sector involvement is essential to sustainable use of coastal resources</u>.

A major purpose of CAMP is to coordinate the initiatives of the various coastal economic sectors toward long term optimal socio-economic outcomes, including resolution of use conflicts and beneficial tradeoff. This integrated, multiple-sector approach is designed to interrelate and jointly guide the activities of two or more economic sectors in planning and management. This supports a programmatic goal to optimize resource conservation, public use, and economic development.

International assistance agencies commonly use the term "sectoral" planning, or management, to describe these activities within a particular economic sector or development area. Some of the more common sectors are: agriculture, forestry, fisheries, energy, transportation, manufacturing, tourism, housing, military, and public health. Any of these sectoral areas can be further divided into more specialized coastal components; for example, transportation may be divided into shipping, ports, and surface transportation (75). A further sector to be considered is the public, or social, sector, including the various publics who are affected by private and government decisions.

Almost every sector has a strong stake in the coastal area. It would be virtually impossible to allocate the coast to a single one of these economic sectors for development, or even to give one or two sectors a priority for coastal development. In

fact, it is the intense conflicts over use of the coast that so often arise among the various sectors that makes the CAMP process so necessary. A major goal of CAMP is to identify conflicts over coastal land and costal renewable resources and to find ways to allocate and manage uses for the optimum long term benefit of the nation in a multiple use format.

In narrow sectoral planning it is easy to irreversibly destroy a resource and foreclose all future options for use of that resource. CAMP attempts to avoid this for coastal area resources by broad multiple-sector planning and project development, by future-oriented resource analysis, and by applying the test of sustainability to each development initiative.

Because the CAMP process operates at the interface between land and water, there is often intense conflict between private (or quasi-private) property-based operations in shorelands and public (common) property-based activities in the tidelands and coastal waters. Thus, the CAMP process may have an important mediating role between conflicting wetside and dryside interests. This essential role should not be played out sector against sector -- the mediating/coordinating entity must look at all sectors with legitimate interests to find the most broadly compatible solutions. The objective of the type of integrated planning used in the CAMP process is the preparation of a comprehensive plan in which the various development sectors are assessed for their effects on the various resources in a given geographic area (of which the coastal area is one of the most distinctive).

As an example, integration may be needed among fisheries, tourism, oil and gas development, and public works where these sectors are all attempting to use the coastal zone simultaneously (75). Both fisheries and tourism depend to a large extent on a high level of environmental quality, particularly coastal water quality. Both sectors may receive "spillover" impacts such as pollution, loss of wildlife habitat and aesthetic degradation from uncontrolled oil and gas development. In another example, fisheries may require port services similar to those that tourism depends on -- an infrastructure system that supplies water, sanitation, transportation, and telecommunications. Therefore, planning for both should be integrated with that for transportation and public works sectors.

It is also clear that the thirty or so developing nations in the humid tropics with extensive mangrove forests should have a strong incentive for integrated coastal resources management. Most developing nations with extensive mangrove forests are confronted with similar stresses which threaten the sustainability of this renewable resource. Conversion of mangrove

Box 3.3

Citizen Participation in CAMP

Participation is a tool available to the entire management community (resource users, public agencies, non-governmental organizations, etc.) to ensure the quality and the effectiveness of the management solutions that will be implemented. Participation is also a duty because the issue remains above all one of human development and because people are not the object of that development but the subject of development and the makers of their own history. It is an instrument of democracy and a guarantee for the overall improvement in the quality of human life.

Participation is not social research, although social research can indeed be participatory. What is implied here is that the effort made by planners and resource managers to better understand the historical, social and cultural background and components of the systems in which they are to intervene is certainly desirable and commendable, indeed indispensable, but it is neither a guarantee nor a tool for participation. It can lead to better informed and more acceptable decisions, but this understanding can remain the privilege of the planner and the manager, without any direct benefit to the community.

Participation is not a "way to sell pre-made decisions" either. It should be a consultation with ideas growing in both directions. Planners and managers too often resort to public participation and involvement only because a particular management decision is difficult to enforce or encounters some form of opposition.

If we were to attempt a definition of participation, we would see it as a true dialogue between all parties concerned with a particular resource in order to ensure that there is a sharing of agendas. Participation is not intended to change the views of the fisherman, the government officials, the planners or the consumer. Nor is it a means to get a particular group or sector "aligned" to the needs of another group. What it does is to ensure that we move from single sectoral concerns and individual concerns to a collective agenda which all parties will be better armed to address. Participation serves to unite people in the sharing of needs and ideas and in the working of solutions.

More specifically, the objectives of participation can be placed at four levels:

- participation is a way to ensure that popular knowledge and experience is indeed integrated into the planning and management process
- participation ensures that all needs and priorities are taken into account in the formulation of management decisions
- participation gives a better guarantee for the quality of the solution identified and for its adaptation to a particular condition
- participation in planning and problem identification promotes involvement in the actual implementation of decisions.

Source: Y. Renard (Ref.No. 66)

forest to aquaculture ponds or croplands often presents a particularly difficult conflict of uses (75).

Coastal natural hazards are usually addressed in sectoral plans for public health and safety. But, natural disasters cut across all coastal dependent economic sectors. Wind damage from a hurricane, inundation by a tsunami, or rapid coastal erosion can affect tourism, the fishing industry, port operations, public works, and transportation. Other sectors such as housing and industry are also vulnerable. The potentially devastating consequences of development in coastal hazard prone areas, necessitate the use of integrated coastal planning (75).

The integrated approach of CAMP is particularly essential for effective multiple use approaches. The concept of greatest yield from the best multiple-use plan takes into view that specific resource systems are always components of a larger ecological system that contain many other resources with economic and social values (73). Also taken into account is the fact that component resource systems naturally tend to be highly integrated and dependent upon one another. For example, in many parts of the world, fresh water is considered to be a limited resource for agricultural and domestic use (73). In the recent past, water development specialists tended to allocate water usage based on the most obvious economic and domestic demands, but failed to take into account the key role of fresh water discharge in the maintenance of coastal estuaries and their fisheries (e.g. the serious depletion of fisheries after damming the Nile in Egypt and the Indus in Pakistan).

Whenever possible, the public sector (the general public of the community) should be consulted about any major coastal development. According to Yves Renard (66), public participation is a tool available to the entire management community (resource users, public agencies, non-governmental organizations, etc.) to ensure the quality and the effectiveness of the management solutions that will be implemented. Participation is also a duty because the issue remains, above all, one of human development, and because "...people are not the <u>object</u> of that development but the <u>subject</u> of development and the makers of their own history". (See Box 3.2 for details)

In summary, in no other part of the earth is integrated, multi-sectoral, resource planning and management more needed than at the coast.

14. <u>Traditional resource management approaches should be encouraged where their results are positive.</u>

Local communities that have exclusive rights to their adjacent marine resources have typically evolved effective

conservation programs. Recently, the potential of "traditional" conservation approaches (customary fishing rights, marine tenure, etc.) has been thoroughly explored. R.E. Johannes, a leader in this movement explains (43):

> Throughout most of Oceania the right to fish in a particular area was controlled by a clan, chief or family. Generally this control extended from mangrove swamps and shorelines across reef flats and lagoons to the outer reef slope. It would be difficult to overemphasize the importance of some form of limited entry such as this to sound fisheries management. Without some control on fishing rights, fishermen have little incentive not to overfish since they cannot prevent others catching what they leave behind. This is a central tenet of fisheries management science. Under modern conditions the government must assume the sole responsibility for placing and enforcing fisheries conservation measures. This is a difficult and expensive responsibility under the best of circumstances; it is close to impossible in most tropical artisanal fisheries. Typically there are far more boats, more distribution channels (both subsistence and market) to monitor and regulate than in high latitude fisheries of similar sizes. And there is usually much less money and expertise available with which to do it.

A corollary to the above, is that the incentive to protect the resource base -- physical habitats and water quality -- is stronger where access to the area is limited to traditional users who still maintain control. Thus, in countries where customary fishing rights are maintained, serious consideration should be given to the maintenance of these rights. However, as Johannes points out: "It would be a mistake to romanticize traditional island fishermen, to view them as ideal conservationists living in perfect harmony in nature and one another."

CAMP should recognize that often the most socially desirable and efficient approach to resource management is allocation according to traditional approaches worked out for specific cultures in specific coastal locations over hundreds or thousands of years. The yields obtained from coral reefs and lagoon fisheries in Oceania, tambaks in Indonesia, acadjas in West Africa, vallicoltura in the Venice region, "fish crawls" on the Mediterranean and Atlantic coasts, and small scale traditional fisheries all over the world, have been maintained over centuries. There is a striking similarity among the successful traditional methods of management and conservation of coastal systems that have been devised by the peoples of very different origins and cultures (67). This commonality of success demands attention to the needs for continuation of traditional methods through CAMP where appropriate, particularly the protection of the community's rights to exclusive use of its traditional fishing areas.

In CAMP programs, criteria for legitimate traditional, or customary, fishing rights and rules of procedure to guarantee their continuance may be appropriate, particularly where establishment of protected areas for traditional fishing are proposed.

15. The environmental impact assessment approach is essential to effective coastal management.

Environmental assessment is a term used to describe both a governmental process and an analytical method. As a process, environmental assessment is usually imposed by government to require public agencies (and in some cases private developers) to predict environmental impacts, to coordinate aspects of planning, and to submit development proposals for review. As an analytic method, it is used to predict the effects of a project or a program. According to Sorenson et al. (75) the three fundamental benefits arising from these objectives are that:

- cause and effect relationships can be determined with reasonable accuracy and presented in terms understood by policy makers;

- prediction of impacts will improve planning and decision making;

- the government can enforce decisions emanating from the environmental process.

The assessment process includes prediction of a proposed project's effects on renewable coastal resources as well as the potential effects on the quality of the human environment. The process when mandated by law or executive degree generally involves a procedure that requires the following information: 1), the characteristics of the project site; 2), description of the project, and 3), description of the environmental impacts of a project for different dimensions of the environment. Usually it is required that alternatives to the project be identified and comparatively assessed, and measures to avoid or mitigate impacts be spelled out (75).

While impact assessment is usually focused on the project level, assessments may focus at the program level, such as for a regional economic development initiative. Program level impact assessment -- when done for a large geographic area -- is conceptually similar to regional planning but does not include a mechanism to compel actual plan making and implementation. The process also encourages application of other important CAMP principles, such as, including multiple use considerations in integrated planning; applying the nature-synchronous approach to

development; and conducting economic analysis for externality effects.

CHAPTER 4. POLICY FORMULATION AND STRATEGIC PLANNING

Every country evaluating the potential of a CAMP-type program will have its own special approach to conservation of resources and will be facing its own distinct array of coastal issues. Therefore, each country's program will be unique. But there are several basic stages in the generation of a CAMP program that will be found to be common to all, in one form or another. These stages are as follows:

1. Policy Formulation: Creation of a policy framework to establish goals and to authorize and guide the CAMP program; accomplished by executive and/or legislative action.

2. Strategic Planning: Sometimes called "Preliminary Planning", this is the stage where the potential impacts of the CAMP policy action are explored (on resources and resource users, on income and jobs, on social and cultural well being), where benefits are evaluated, where a wide array of data is accumulated, and where a general strategy is created and recommendations are made for organization and administration of the CAMP program.

3. Program Development: Once the Strategic Plan is accepted by policy makers development of the CAMP program can commence and a detailed Program Plan for its implementation can be created.

4. Implementation: Once the Program Plan is approved and a budget and staff are authorized, this stage, the Implementation Stage, commences.

In practice, the above stages are not so discrete and linear as theory suggests. Instead, there will be feedbacks and revisions of earlier stages as new facts and opportunities come to light in later stages. For example, there will certainly be the need for policy revision and strengthening as a result of findings and recommendations from stages two and three. Therefore, the whole program must be flexible and adaptable.

The information needed for the policy stage is only to guide the process of deciding whether a CAMP program is needed. In the strategic planning stage, the information needed is mainly for convincing decision makers of the need to authorize a CAMP program, or not to if it is not feasible or appropriate. It should be noted that strategic planning is a reconnaissance level activity and the information required is far less detailed than for the program development stage to follow.

The remainder of this chapter considers the first two stages in development of a CAMP program: Policy Formulation and Strategic Planning. Program Development and Implementation are addressed in the following chapter.

4.1 Policy Formulation

No CAMP type program can be stronger than its policy foundations. Clear and specific goals and directives are essential aspects of policy formulation; objectives will be organized as part of the Strategic Planning stage (see Box 4.1).

The required clarity and specificity can only be expected if the country's policy makers are convinced of the value of CAMP and are willing to make a strong commitment. To achieve this optimum state will require a considerable political effort on the part of CAMP advocates. This effort must continue through the entire process, i.e. through all stages of development of the CAMP program.

Gaining support for CAMP. In convincing supervisors, decision makers, and legislators of the essentiality of a CAMP program, nothing is more important than persuasive economic evidence. National income, foreign exchange earnings, employment and local self sufficiency are most important factors (see Principle 10, Chapter 3). These factors must be addressed during the policy formulation stage in a preliminary but convincing manner. Then in the Strategic Planning stage -- which is the principal means of selling the CAMP program -- economic benefits must be addressed in a more detailed way. Because of the importance of economic justification of CAMP, it may be desirable to employ a professional resource economist to assist with the economic analysis.

Policy formulation will be expedited and strengthened by broad consultation with the municipal and provincial governments which may be most affected by the CAMP program. Equally broad consultation with a variety of national government ministries will also pay off in greater cooperation and less opposition (see Principle 8).

It is also most important to have the support of, or at least the acquiescence of, the resource users affected the most. Strong political opposition by fishermen or other gaining their living from marine resources can stall a CAMP program. Therefore, beginning with policy formulation and continuing through each subsequent stage of development of the program, coastal public interest groups should be consulted (see Principle 10). Y. Renard (66) identifies the following broad themes as examples of those that should be addressed:

Box 4.1

Aspects of Policy and Planning for CAMP

Different branches of government have been responsible for different aspects of marine affairs. One branch of government may be responsible for fisheries, another for tourism, yet another for transportation. Planning and environmental issues are often the concerns of still other departments. While all of these branches of government are ultimately concerned with economic and social development, they can unwittingly impede development of other sectors and create conflicts of usage from fragmentation and lack of communication. Often apparent conflicts can be easily resolved and with careful planning the resource base can sustain multiple usages. By taking an integrated approach, development potential of all sectors can be maximized, conflict minimized, and the resources protected. This usually requires a reassessment of policy.

Arriving at a realistic policy for marine resource management requires that this re-evaluation be a shared effort among the resource management community. Naturally this means the various groups involved must compromise, since their individual goals will be quite diverse. But a major purpose of the multi-disciplinary, participatory approach is to foster compromise and cooperation in the community. If the effort is successful, what will emerge will be a policy that is rooted in local dynamics, and the options chosen will be ones that can actually work for the community as a whole.

Of course other more tangible factors have to be included in policy determination as well.

Successful policy must be based on solid biological and socio-economic and socio-cultural information.

The purpose of management planning is to achieve a desired situation, and the direction that management policy takes is dependent upon the desires of government and resource users and consumers. These desires are synthesized into an ideal that becomes the **goal** of management policy. While not realizable, this ideal provides direction. **Objectives** are specific outputs necessary for progress towards a goal. Objectives generally are obtainable, and are used to determine what actions need to be taken. Objectives should always be based on solid biological and social data.

Goals and objectives serve two important purposes in management planning: they are the foundation for determining management policy, and they are the standards by which to judge success.

Source: Tighe Geoghegan (adapted from Ref. No. 33)

- determination of economic, social, political and cultural situations.

- respect and support for the culture

- dialogue; sharing of agendas and mobilization (not "confidence building"); ability to listen

- intervention based on the human system as well as on the natural system; multi-disciplinary and multi-sectoral approaches

- participatory research: use of folk knowledge; permanent redistribution

- collective problem identification; formal and informal activities

- formulation of solutions; promotion of consensus

- utilization of indigenous technology, savoir-faire and experience

Because the support and cooperation of numerous economic sectors is essential to the success of integrated, multi-sectoral programs such as CAMP, it will be necessary in the policy formulation stage to consult with representatives (public and private) of the sectors that are likely to be most affected (see Principle No. 13). Many of these sectors will have little to gain from coastal resources conservation and they may see the CAMP program as a problem rather than as an opportunity; examples are transportation, housing, military, agriculture, and manufacturing. To ensure a minimum of opposition from these sectors, strong persuasion may be needed along with assurance that the policies to be formulated will treat them fairly.

Sectoral fears can also be alleviated by stressing the multiple-use function of the CAMP program in the policy statement (see Principle 12). Under CAMP most coastal areas would be open for a variety of compatible uses. Only certain resource reserves, critical habitats, and other specially designated areas would be set aside for restricted or single-purpose use.

It is most difficult to provide advice on how to effectively promote a CAMP program because the art of politics is so specific to each country, but the advice of R. Knecht in Box 4.2 should be of value to most countries. Knecht lists five policy approaches that should be considered by all CAMP advocates.

Preparing the Policy Statement: The policy statement should declare in the strongest terms possible that it is the intention of the nation to review and exercise control over developmental

Box 4.2

Convincing Your National Government of the Merits of CAMP or Coastal Zone Management (CZM)

The following five points would be useful in discussing the merits of CZM with a national government:

1. Emphasizing the development aspects of coastal management is a positive approach.

2. The "balanced" nature of the coastal management approach should be emphasized. The emphasis in the program also should be on management, that is, the prudent use and development of resources, and not on preservation per se. Of course, protection of sensitive coastal areas is a key objective of CZM.

3. Determine early who is potentially opposed to CZM and develop arguments particularly aimed at that sector.

   - Energy and industrial interests can be convinced that CZM will facilitate rational development and increase the predictability of the coastal situation.

   - Local authorities should realize that they can increase their impact on national government coastal policies through a partnership involving local CZM programs.

   - Rival government agencies should be incorporated into the CZM planning process early on and made partners in the program.

4. Clearly, one needs to argue the logic and reasonableness of rational coastal planning and management and obtain a maximum number of allies for this point of view.

5. Governments involved with planning for 200-mile exclusive economic zones should understand the value of a foundation of rational coastal planning and management.

Source: R. W. Knecht, Administrator of the U.S. Coastal Zone Management Program, 1973 - 1980 (modified from Ref. No. 47)

activities affecting the sustainability of coastal renewable resources. The goal should be maintenance of the optimum sustainable use of coastal renewable natural resources, in both the economic and social context. The policy should then list specific national coastal concerns and issues to be addressed and state the priorities of the nation toward coastal resources conservation. The policy statement should also state the actions that the executive authority or legislative body expects various agencies of government to take. In addition to specific assignments to agencies for the strategic planning stage to follow, there should be assurance that funds are authorized and available to pay for the work that must be done.

But in policy formulation it is not reasonable to expect specifics; the Policy Statement will most likely contain general goals and directives. In fact, specifics should be avoided because it is far too early in the process to make informed decisions about specific program components or objectives. There is danger in getting locked into specifics that prove to be misdirected and that may seriously hamper strategic planning and program development.

The most important component will be the requirement for creation of a Strategic Plan to accomplish the goals set forth. One expects that after policy declaration, government will next need to know a great deal more about the issues, conflicts, economic tradeoffs, benefits and CAMP potential and working mechanisms before it would authorize development of a program with specific forms of implementation. Answers to these questions would come from the CAMP Strategic Plan.

Coastal resources conservation policy should emphasize that it is in the best interests of the country to achieve sustainability of its resources and long-term protection of its natural assets. Sustainable exploitation implies the wise use (development) and careful management (conservation) of individual species and communities together with the habitats and ecosystems on which they depend so that their current or potential usefulness to people is not impaired. Resources should be maintained so that the ability of a resource to renew itself is never jeopardized. Such management maintains biological potential and enhances the long-term economic potential of renewable natural marine resources. To this end the set of goals suggested for a proposed Saudi Arabia CAMP program for the Red Sea listed below is worth reviewing (adapted from Ref. no. 20):

- <u>Maintain a high quality coastal environment</u>. The coast is a major national resource, providing commerce, food, recreation, spiritual refreshment, and security. But this productive state is not guaranteed to last forever; the coast could easily become polluted, ugly, and unproductive along much of its length if

development safeguards are not applied. CAMP would create and enforce standards for maintaining the quality of the coastal environment.

- Protect valuable species. A quality coastal environment is favorable to most species but some of the rarest and most important ones need extra safeguards; CAMP would reserve their special habitats (e.g. offshore islands) through a protected areas program and provide other protection through administrative means.

- Conserve critical coastal habitats. Habitats of special importance to species and to the functioning of coastal ecosystems include -- stands of mangrove trees, submerged meadows of seagrass, coral reefs (and reef lagoons), sandy beaches and dunes, and certain tideflat habitats. Wherever these occur on the coast they are presumed to be "critical habitats", the loss of which would reduce productivity as well as species well being and ecological balance. Therefore, a general, coastwide, program of conservation of these habitats is needed.

- Conserve critical ecological processes. Certain ecological processes are critical to the productivity of coastal ecosystems; e.g. light penetration through the water (which can be blocked by excessive turbidity) and water circulation (which can be blocked by infills and causeways). These critical processes need protection through regulation of development and appropriate planning standards.

- Protect environmentally sensitive areas. Certain ecosystems are of such outstanding ecological value that they should be set aside and protected from alteration by development; these include many of productive lagoons, reefs, and islands along the coast and their adjacent shorelands. These areas are too important and sensitive to address in piecemeal fashion and should be preserved intact as ecological units, requiring that they be set up as "custodial protected areas" or as "administrative protected areas".

- Control pollution. Pollution from point sources and from land runoff as well as accidental spills of pollutants can foul coastal habitats and waters causing human health problems as well as ecological disruption and reduce productivity. The proposed CAMP program would assist pollution control officials to keep the coast clean and productive.

- Provide development guidance. Much of the ecologic and scenic disruption of the coast is from inadvertent side effects of coastal development. An effective CAMP program would provide advisory services to development entities to enable them to design and construct projects that avoid conflict with coastal conservation to the extent possible.

- Provide planning guidance. To avoid initiatives which would be damaging to the coast, advice would be provided to planning entities of all kinds through the proposed CAMP -- physical planners, economic planners, development planners, and so forth. Of particular importance is the control of infrastructure so that highways are properly routed and water and power are not provided to places where development should be discouraged.

- Identify critical lands. Certain areas of the coast have a special potential for recreation, housing, nature protection, economic development, and so forth. The CAMP program would identify lands to be reserved for nature protection and would advise development entities of areas that would be optimum for development.

- Restore damaged ecosystems. Many otherwise productive coastal ecosystems have been damaged but are restorable. For example, hydrologic blockage -- a major problem for many coastal lagoons -- could be corrected by excavation, armoring or culverting. The CAMP program would offer many opportunities to identify these problems and find solutions.

- Public awareness. CAMP can play an important role in creating public awareness of the values of the coast and needs for coastal conservation.

In many countries a considerable amount of policy affecting coastal renewable resources will already be in existence. Therefore, an evaluation of this policy is a first step; creation of new policy to fill gaps and integrate existing policy is a second step. The Philippines is an example of a country where considerable policy and operational legislation has been enacted which all together gives a sufficient policy base for an integrated CAMP program. Two examples of the 15 different policy instruments are given below (56):

Section 26 of Presidential Decree No. 1152 (Philippine Environmental Code) states that the national government, through the Department of Natural Resources (now the Ministry of Natural Resources), shall establish a system of rational

exploitation of fisheries and aquatic resources within the Philippine territory and shall encourage citizen participation therein to maintain and/or enhance the optimum and continuous productivity of the same.

Section 27 of Presidential Decree No. 1152 provides for the measures for the rational exploitation of fisheries and other aquatic resources which include, but shall not be limited to: a) undertaking manpower and expertise development; b) acquiring the necessary facilities and equipment; c) regulating the marketing of threatened species of fish and other aquatic resources; d) reviewing all existing rules and regulations on the exploitation of fisheries and aquatic resources with a view of formulating guidelines for the systematic and effective enforcement thereof; and e) the conserving of the vanishing species of fish and aquatic resources, such as turtles, sea snakes, crocodiles, corals, as well as maintaining the mangrove areas, marshes and inland waters, coral reef areas and islands serving as sanctuaries for fish and other aquatic life.

A very general policy statement recommended by the Interagency Legal Committee of the Natural Environmental Protection to begin the process of organizing a CAMP-type program is as follows (79):

It is hereby declared a policy of the State to pursue a continuing program of effective management of coastal zones to meet the socio-economic development needs of our country for the benefit of present and future generations. In pursuing this policy, it shall be the responsibility of all government bureaus, agencies or instrumentalities, including political subdivisions involved in coastal management, to instill awareness to the public about the dangers of the degradation of environmental conditions in the country's coastal zones and encourage active participation of the people in all undertakings to conserve and enhance the country's coastal zones.

4.2 Strategic Planning

This stage involves all the preliminary investigation, data collection, dialogue, negotiation, and draft writing that is necessary to enable the government to understand its options and to authorize a specific CAMP program. This is not the detailed planning stage for a management program; that comes in the Program Development phase. It should be noted that there is not a fixed cutoff between the work done and materials generated for the Strategic Planning and the Program Development stages. On the contrary, the cutoff point would be expected to vary greatly between programs of one country and another. The demands of

circumstance will dictate what is enough for the plan and what should be done during development of the CAMP program.

The strategic plan lays the foundation for the legislation or the executive order that is needed to authorize the Program Development (tactical) stage that follows. It should: 1), specifically assign responsibility for the program to a particular agency; 2), authorize the funding necessary for program development; 3), state clearly the objectives of the CAMP program; 4), recommend a method for collaboration among the various sectoral agencies and private interests involved; 5), state the time limits involved for various stages of program development; and 6), require a specific program development, or tactical planning and organizing process.

While many countries may not, in the end, choose to go to a full scale, integrated, CAMP approach but rather adopt a less sweeping program, they are well advised to strive for the CAMP goals of comprehensive and integrated coastal resource management initially, in the planning phase -- in effect, to take a regional planner's approach. For example, the organization of a coastal program to manage mangrove forests for the sole benefit of the fisheries sector might succeed, but more likely it would fail if it lacks mechanisms to incorporate the interests of local villagers, forest industries, upland agriculture, public health, tourism, port development, and so forth. Therefore, if a full-scale CAMP regional program can be organized, at least in the planning phase, a more satisfactory outcome can be expected. However, the realities of political, economic and social life of the particular country may require a less ambitious, more restrictive, beginning; for example, a targeted management program on, say, shore erosion or perhaps defined critical habitats. Such targeted programs might later evolve into more full scale regional CAMP-type programs, as is occurring in Sri Lanka (81) where CAMP started because of an erosion issue and has expanded into a broader program.

It is useful to compare CAMP to other types of regionally organized development/conservation programs, such as, river basin planning or watershed management. These activities have been conducted for many years in many countries and this experience is useful in evaluating CAMP type programs. For example, river basin planners may organize their programs at any one of the four levels below:

1. <u>Water supply planning</u>: The program focuses on development of water supply to urban centers only and does not consider other uses or economic sectors.

2. <u>Multipurpose water planning</u>: The program considers all uses of water from the source at hand, but not other sectors.

3. Integrated water planning: The program focuses on water uses but coordinates with other economic sectors.

4. Comprehensive water planning: The program incorporates water use planning into an evenhanded general economic development program where all sectors are given equal priority.

The CAMP process, in the form proposed in this book, is analogous to the third level above, where the subject is conservation of coastal natural resources but where planning is fully integrated with other economic sectors as appropriate (e.g. mining, fisheries, housing, industry, tourism, agriculture, etc.). We do not believe that level 1 or 2 analogs provide the multi-sectoral interaction necessary to plan and implement a balanced program of sustainable multiple use of coastal resources. For most countries it seems appropriate and possible, at present, to elevate coastal natural resources to the priority position they would have in a "level 3" type approach in the above analogy.

Form of the CAMP Program: A CAMP program can be structured to fit into any governmental structure. The variety of institutional arrangements is sufficiently flexible to match whatever administrative system a country has. In its most rudimentary form a CAMP program can be initiated with only three components:

1) a central government coordination office.

2) a project review system for all major coastal developments.

3) a capability to ensure compliance with established standards.

All CAMP programs require these three components as a minimum; elaborations can be added as appropriate, including technical assistance, planning, inspection, extension services, public education, research, regional (sub-national) programs, protection of critical habitat areas, survey and mapping, habitat restoration, training, and so forth.

The particular form of any CAMP program will depend upon the national and regional issues it is meant to address. Since the tableau of issues and options varies from country to country, so will the form of the program. No two countries would be expected to have identical programs. But the essential purpose remains the same -- to create an interagency mechanism to promote sustainable uses of renewable resources within the defined coastal area. Accordingly, some of the most destructive "development" practices -- massive coral reef mining or mangrove forest cutting -- will

Development Activity	Marshes	Deltas	Estuaries	Mangrove swamps	Seagrass beds	Coral reefs and lagoons	Beaches	Islands
	Type of Ecosystem							
Agriculture and farming		●	●	●	○	○		●
Feedlots, ranching, and rangelands	○	○		●	○	●		●
Forestry		○		●				○
Aquaculture and mariculture	○	○	●	●	●	○		
Nearshore-catch fisheries		○	●	○	●	●		○
Dredging and filling	●	●	●	●	●	●	○	○
Airfields	○	○	○	○	●	●	●	●
Harbors	●	●	●	●	●	●	○	●
Roadways and causeways	○	●	●	●	●	●	○	○
Shipping		●	●	○	○	○	○	○
Electric power generation	○		●	○	●	●	○	○
Heavy industry (onshore)	○	●	●	●	●	●		●
Upland mining	○	●	●	○	●	●		○
Coastal mining	○	●	●	○	●	●	●	●
Offshore oil and gas development		○	○	●	●	●		●
Military facilities, training, and testing	○				●	●		●
Land clearing and site preparation	○	○	○	○	○	○	●	●
Sanitary sewage discharges	○		●	○	○	●		●
Solid waste disposal	●	○	○	●			○	●
Water development and control	●	●	●	●				●
Shoreline management and use		○				●	●	●
Coastal resource uses	●	●	○	●	●	○	●	●

● Significant adverse effects likely
○ Adverse effects possible

Figure 4.1. Development activities that can adversely effect selected important coastal tropical ecosystems (Source: refs. no. 48 & 5)

usually have to be curtailed because they are not sustainable and conflict strongly with other economic uses such as fishing and tourism. On the other hand, development activities with a lesser potential for damage can be adjusted in location, design or scale in order to meet guidelines (Figure 4.1).

Approach to Strategic Planning: To create the strategic plan for a CAMP program requires that the planners consult with a wide array of interests, both governmental and private. Figure 4.2 depicts the complexities that face strategic planning--numerous sectors are involved and strong political and economic pressures come into play. It is the accepted wisdom of CAMP experts that only a truly integrated program (i.e. one that includes all the major economic sectors affected) can succeed fully. If important stakeholders are left out -- e.g. tribal chiefs, port authorities, housing departments, tourist industries, fishermen, economic development planners -- CAMP will likely fail. In fact, one of the functions of CAMP is to provide a framework for coordination of a wide array of interests.

Data collection and assimilation is an important part of the strategic planning phase. It is during this phase that the most important decisions will be made about the future of the CAMP program, or even whether it will have a future. Clearly, these decisions should be made in the most data-rich of circumstances so that the consequences of taking or not taking specific actions are predictable. Because the information needs for a strategic plan depend upon the issues to be addressed and because these vary considerably from country to country, it is not possible to set forth a standard list of information requirements for a CAMP program from which to prescribe a data compilation program. However, we have listed below some of the more common information items that strategy planners often need:

- Coastal renewable resources: Fisheries and aquaculture activity and yields, by species and seasons; mangrove forest exploitation, activities and products.

- Users of coastal areas and resources: Tourism and recreation, manufacturing, maritime trade, mining, urban, oil and gas industry, jobs, revenue, investment and tax yields.

- Impacts: Impairment of coastal resources and ecosystems; pollution, habitat losses, species depletion, sedimentation, visual degradation, (see Table 2.1, Chapter 2).

- Upland effects: Impairment of coastal resources from river dams and diversions, accelerated sediment transport, reduction of freshwater inflow, disruption

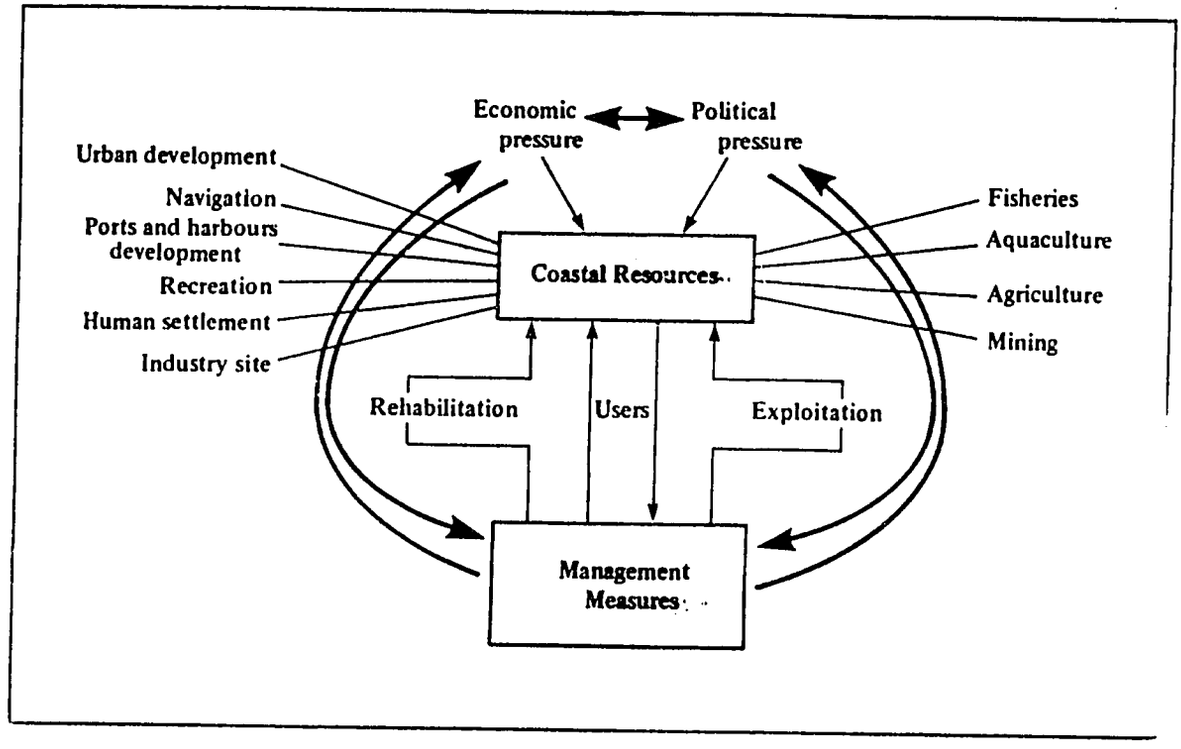


Figure 4.2. Forces at work on coastal resources include a variety of economic sectors and political powers, each with a stake in levels of exploitation. Creation of management measures to control exploitation and rehabilitation of coastal resources are the role of CAMP programs (Source: ref. no. 41)

of natural hydroperiod, reduction of beach nourishment with erosion and pollution.

- Socio-economic status: economic statistics for coastal communities; information on social organization of coastal communities and dependencies on coastal resources.

- Critical habitats: Habitats of critical importance such as mangroves and other wetlands, beaches, dunefields, seagrass meadows, coral reefs, tideflats, estuaries, lagoons, shellfish beds, and special breeding and feeding areas for coastal species; restoration needs.

- Critical species: Identification of the coastal species of particular significance or economic value and their habitats and trends in their populations; restoration needs.

- Resource problems, conflicts: Information on special problem situations, such as highly polluted estuaries, extensive mangrove clearing for aquaculture ponds, destruction of coral reefs, etc.

- Natural hazards: Identification of areas of high risk to natural hazards such as badly eroding beaches, floodable lowlands and islands, landslide prone slopes, etc.

- Protection areas: Description of areas that should be put into designated parks or other types of protected areas.

It is expeditious to organize the strategic plan so that essential information can be mapped and to display as many categories of data as possible on maps. For example, a Caribbean Conservation Association report (34) states: "It has been found time and again that perhaps the most useful way for the environmental planner to discover trends, conflicts, and problem areas that can otherwise be easily overlooked, is by mapping information".

In collecting data and synthesizing information for the strategic plan, it should be remembered that the purpose of this stage is to bridge between the policy and the program development stages. The information is to be used in getting a CAMP program approved, or disapproved if it should be discovered that the country does not need or want CAMP for whatever reasons. Therefore, the kinds of information needed for the strategic plan are those that will enhance the decision making process, that clearly depict the tradeoffs between the present situation and a

CAMP approach, and that lead to the clearest and least ambiguous set of objectives and mandates to the governmental agencies who are to manage the CAMP program, should the country decide to establish one.

Use of the Strategic Plan: One way to think of the Strategic Plan is that its purpose is to answer questions in the minds of decision makers in government. The answers will lead to decisions to authorize or not to authorize the next stage, Program Development, or to request more fact finding. To this end, the strategic planning stage should be organized to anticipate the questions that decision makers will ask and to provide the data to answer these questions, whether they are national or regional in scope. Examples of the type of questions to be answered are the following:

- Which coastal resources are seriously degraded; to what level have yields fallen; what are the economic consequences; what actions are needed to correct this situation?

- 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 tradeoffs and their effects what actions are recommended?

- Who are the principal users of coastal renewable resources; how many jobs are at stake; how much income and foreign exchange earnings are involved in tourism, fisheries, and other resource dependent industries; what further losses are expected if CAMP is not implemented? (see Box 4.3).

- What are the priority issues; what critical habitats need special protection; what species need protection; what is the best approach, regulation or protected areas?

- What can a CAMP type program do to prevent loss of life and property from coastal natural hazards such as seastorms and beach erosion; what are the benefits of combining hazards protection and resource conservation in a single coastal program?

- What are the existing government programs for coastal renewable resource sustainable use (conservation) at national and local levels; how effective are they; what are the shortfalls; what changes in governance are recommended?

Box 4.3

Economic Evaluation of Coastal and Marine Parks and Protected Areas

Since planning should accomplish certain defined goals and objectives, the planner hopes that these will be clearly laid out. However, because such goals are often ambiguously stated, the planner's first job may be to interpret and refine the mandate for the planning process and to request necessary clarifications. In so doing, the planner may find that the program needs substantial and detailed justification, particularly when it is based on administrative rather than legislative action. The justification may be based on political, social, or economic grounds. Economic justification is now fashionable, and the planner should be prepared to provide the necessary analysis of costs and benefits for the program.

Quantitative economic indicators of protected area values are usually numbers of visitors or jobs created, tons or value of fishes landed, money or days spent in hunting and recreational fishing, and so on. Examples of measures of monetary benefit are:

- Gate or license fee totals, to indicate the economic value of tourism to the protected area. These are also indicators of the willingness of the public to pay for recreation privileges at the site.

- Total tonnage at dockside or retail value of fish landings to calculate the contribution of a protected area to fishery revenues (i.e., the economic value of the breeding ground of a fishery resource).

- Total income from recreational and commercial equipment, lodgings, and food and transportation to estimate the contribution of a protected area to supporting industries.

- Total hotel catering, product processing and packaging, equipment production (factory) and distribution (outlet), guide, and other jobs in industries linked to the protected area.

- The probable total cost of property damage (to roads, buildings, livestock, and crops) through storm waves and winds multiplied by the probability of storm damage (i.e., after the felling of mangrove, disturbance of dune vegetation, or blasting of coral reefs) to obtain an estimate of the annual benefit of natural storm damage control.

- The number of visiting students or student groups, their range of ages, and the number of teaching institutions represented These give estimates of the value of the protected area for education.

- The number of researchers, research projects, theses, and publications, to indicate the value of the protected area to research.

- Head, bus, boat or group counts of visitors to a protected area. area. The figures can be expressed as a total or a percentage of the state or national population for an estimate of the social value of the site.

Another approach to estimating the value of a protected area is to calculate the cost of rehabilitating the habitats and restoring the species decimated in the absence of area protection.

The next few years will almost certainly see an increase in types and means of quantification for evaluating protected areas.

Source: Rodney V. Salm and John R. Clark (adapted from Ref. No. 69)

- How effective are the existing mechanisms for interagency and inter-sectoral coordination on coastal matters; what can be done to improve the situation; what actions are recommended?

- Should the CAMP emphasis be on national standards or regional programs?

- What are the expected net benefits of an integrated national CAMP type approach, in economic and social terms; how can a CAMP program be funded?

- Who are the major proponents and opponents of the proposed CAMP program?

- What is the status of personnel training for CAMP; do we have sufficient expertise; what can be done to improve the situation?

To consider the more specific questions that are involved, it is useful to review the major objectives given in the CAMP strategic plan generated for the Sultanate of Oman by R. V. Salm (70,71):

- establishment of conservation areas

- management of recreational resources

- management of fisheries resources

- protection of cultural and archaeological resources

- maintenance of coastal aesthetic resources

- conservation of threatened wildlife resources, such as turtles and seabirds

- management of special environments, such as mangroves, coral reefs, sand dunes, beaches, lagoons, dry river valleys and flood plains

- proper design and construction of coastal developments such as harbors, marinas, seawalls, groynes, piers, breakwaters, coastal roads, and dams

In most countries it is beneficial to get the widest range of participation possible at the Strategic Plan stage. Consultations should be held with all relevant agencies of central and local government, with private developers, with resource users and other interests that would be affected by CAMP (fishermen, farmers, etc.), environmental advocacy groups, and investment sources (including international donor institutions).

These interests should be encouraged to go beyond dialogue and to participate to the maximum possible in goal setting, data collection, conflict identification and so forth. Wide participation will improve the structure of the CAMP program. It will also provide an opportunity to resolve conflicting points of view among powerful interests so that the strategy plan will meet the least political resistance as it goes through the approval process and so that the next phase, Program Development, can proceed smoothly and not meet unexpected resistance.

In some countries the result of the strategic planning stage will be to modify existing planning and resource management mechanisms to accommodate CAMP-type needs. For example, Trinidad and Tobago experimented with CAMP (starting in 1978) and conducted preliminary investigations of the potential for a regionalized approach. The country finally decided in 1984 that the established Town and County Planning Division could handle coastal development management with technical assistance from the Coastal Area Planning and Management Division of the Institute of Marine Affairs. According to H. McShine (52): "It was decided that a separate Coastal Area Plan as distinct from an integrated National Physical Development Plan involving coastal development should not be formulated."

Issues Analysis: It will be most beneficial to conduct a formal analysis of the significant issues facing coastal resources and coastal development. CAMP is an issue-driven process and the nature of the particular issues will dictate the type of program to be created. Also the reality is that the effort and expense required to set up a CAMP-type program would not be justified unless there were multiple issues of importance to address.

It is not enough to simply identify and list the issues. Each should be evaluated for at least the following: the extent of socioeconomic and conservation disturbance it causes; the degree to which it could be resolved by a CAMP-type approach; and the consequences of not resolving it.

Sorenson et al (75) make the point that there should be a good fit between the set of issues a CAMP program is attempting to resolve and the institutional mechanism set up in response. These authors also remark that the issues that motivated a nation to create a CAMP program are likely to reappear as the criteria for program evaluation. The universality of major issues is discussed in Box 4.4.

Jurisdiction: It is a major objective of CAMP to facilitate improved coordination among levels of government and their various bureaucracies toward defined resource conservation goals. This may require realignment of institutional arrangements at various levels of government. The very fact that a CAMP program

Box 4.4

Macro Issue Identification

A few common themes demonstrate how the issues provide an international structure to the field of coastal management. Virtually every coastal nation with a major metropolitan area bordering an estuary appears to have an estuarine pollution problem - usually as a function of municipal sewage and industrial toxins. The estuary pollution issue arises in all coastal nations - irrespective of the degree of development or variation in environmental and socio-economic conditions. Similarly, nearly every coastal nation that actively harvests its coastal fishery stocks appears to have an overfishing problem (a predictable result of common property exploitation). Coastal nations with substantial mangrove acreage almost always experience stresses from watershed practices, pollution, filling, and the overharvesting of timber for fuel. Similarly, every discussion of a coastal nation's institutional arrangement seems to recite the same litany of policy-making problems. Inadequate information, lack of intergovernmental coordination and inadequate professional resources are almost required conditions to motivate integrated coastal resources management.

Of 50 impact issues listed, 28 of them concern effects on fisheries yield and 18 of them concern effects of tourism and recreation attraction. Fisheries conservation and the maintenance of tourism or recreation quality clearly emerge as the two main arguments for integrated coastal resources management. These two coastal uses are affected by almost all of the other use activities listed. The economic importance of fisheries and tourism will strongly influence the extent to which developing nations will want to initiate coastal resources management programs. Mangrove forestry operated on a sustainable yield basis appears to be of secondary importance, but is a significant coastal dependent sector in several nations. The greater the value of coastal fisheries, coastal tourism, and mangrove forests to the national economy and coastal populations, the greater the nation's interest in coastal zone management.

The list of impact issues clearly illustrates the zonal nature of the coast. Nineteen of the issue impacts occasionally or always originate in coastal watersheds-- often far inland from the shoreline. On the ocean side, 10 of the issue impacts can originate offshore and move landward to adversely affect coastline or estuary environments.

Source: Sorenson et al. (Reference No. 75)

is being considered for a country suggests that in the past adequate attention has not been given to conservation of coastal renewable resources. Something different is needed.

There is no single answer to the question: "Where should the CAMP authority be lodged within the government institutional structure?" The correct answer will be different for each country depending upon answers to other questions, such as: Would a coordinating office be sufficient? If so, within what ministry should the office be lodged? Or would an agency with power to act independently be needed? What kind of staff skills are necessary? How would such an agency integrate the roles of the several sectorally oriented agencies with strong interests in the coast? These are crucial points that must be addressed. A CAMP agency must be part of, or have influence over, the economic development sectors. A central coastal office is realistic only if its functions are non-competing and its main role is coordinative.

It may be useful to designate a particular Ministry for Strategic Planning and another for management, including program development and implementation.

One thing for certain is that CAMP must be integrative, not preemptive. Its role is to make judgements about development and resources management that are for the good of the nation as a whole not for the good of a particular economic sector or agency of government. CAMP is committed to advancing sustainable multiple use of coastal resources (Premises 11, 12) through an integrative, multiple sector approach (Premise 13).

In the CAMP process, legislation and administrative arrangements should be as flexible and cost-effective as possible and should adhere to simple guidelines such as the following proposed for marine protected area programs (69):

- New agencies should be created only where existing agencies cannot be adapted, motivated, and empowered to carry out adequately the task.

- Existing agencies with jurisdiction over marine activities should be involved by interagency agreement as necessary and appropriate to meet the conservation objectives.

- Existing uses should be disturbed as little as possible.

- Existing regulations and regulatory mechanisms should be continued when they are consistent with conservation objectives.

- Regulations and management plans should be as simple as possible.

Boundaries: Planning boundaries for the coastal area, or coastal zone, must be specified at the Strategic Planning stage. Initially a relatively broad planning zone should be delineated. Subsequently, a narrower management zone, or zones should be delineated. It is important to recognize that CAMP programs evolve through stages from initial planning to final management program. The first set of boundaries, as described above, are for the planning phase and do not imply that the entire coastal zone delineated for planning will be included in the management program that evolves. In fact, the zone of management that emerges will in most cases be considerably narrower than the initial zone of planning for CAMP.

The CAMP 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, CAMP planning boundaries should be functional boundaries, encompassing natural ecosystems and natural forces. But at the same time it should reflect the boundaries of towns and industrial centers; that is, where possible the boundaries should be modified to include an entire community and not divide it into two parts, a coastal zone part and a non-coastal zone part.

Coordination: At the strategic planning stage it is most important to recommend a strong coordinating mechanism to ensure the widest and most effective participation of government agencies, the business sectors, and the public. Getting the coordinating mechanism working right is clearly the most difficult part of the creation of a CAMP-type program because coordination is one of the inherent problems of the CAMP process. Numerous private economic sectors and the corresponding numerous government bureaucracies directly or indirectly affect coastal uses, resources, and environments. Horizontal integration is a term that describes efforts to coordinate the separate economic and governmental sectors and thereby reduce fragmentation and duplication (75).

Economic Impacts: For most countries the motivation for implementing a CAMP-type program will be very practical. Definite economic benefits will have to be shown. Explicit and persuasive social benefits will also be helpful. The values that developed nations put on biological diversity, saving endangered species, and protecting environmental quality will not usually be embraced by developing countries unless they attract international tourists. The burden of proof put on advocates of CAMP is to show clear socioeconomic benefits.

The complexities of evaluating coastal renewable resources and measuring the economic impacts of development require that

special methods be devised and used in CAMP. This requirement applies to countries with economic/political systems ranging from laissez-faire approaches to centrally planned economies. Regardless of the type of economic system that is in place, a special mix of economic tradeoff analyses is required for CAMP because of the nature of coastal problems and the common property resources that are usually involved. This mix consists of standard economic and financial tools coupled with special approaches developed for coastal natural resources and amenity evaluations. Among the most commonly used approaches recommended are such forms of analysis as: net present value, internal rate of return, and benefit-cost ratio. Other approaches, such as cost-effectiveness analysis, also may be used.

Unfortunately, there are not simple "cookbook" techniques that can be employed in conservation economics. It will usually be necessary to engage a professional resource economist to assist with economic analyses. If this is not possible, it will be necessary to make the best estimates possible to build a persuasive justification for the CAMP program.

Coastal Project Review: As has been stated many times, an essential element of a CAMP-type program is a system to review major development projects impacting coastal resources. Such a system would most usually be built around the typical and well known "environmental assessment" technique.

The Strategic Plan will need to recommend the general approach to project review and some particulars about the environmental assessment procedure to be used. It is usually best to have two or three levels of assessment of increasing complexity; the first level would be a preliminary review to see if there are potential serious impacts. If so, the project would be subject to higher level, more intensive, assessments.

Some recommendations on possible mechanisms for project approval would also be appropriate for the Strategic Plan. Most probably the appropriate techniques would involve a permit system, whereby the development entity could not begin the project until a permit was issued by the CAMP agency.

Critical Areas and Species: As regards coastal and marine parks and protected area initiatives, effective coastal and marine conservation programs should include both regulatory and protected areas components. The regulatory component provides a broad framework for controlling uses of coastal resources, including regulations, permits, environmental assessment, and development planning, operating through administrative process. The protected areas component provides custodial protection for parks, reserves, and other areas of special resource value, operating through exercise of proprietary rights. By combining the two, there is created both 1) a regulatory scheme for

resource conservation and orderly development and 2) a specific protected areas scheme for high level protection of special resources (23).

The particular importance of combining the two approaches was emphasized during the World Congress on National Parks (Bali, October 1982) at the Workshops on Managing Coastal and Marine Protected Areas. The report from the Workshops summarized the case as follows (69): "The aim of coastal zone management...should be to complement and enhance existing conservation efforts through a coordinating mechanism, and 'umbrella' program under which coastal and marine protected areas can prosper." The conservation approaches suggested are keyed to facilitating economic development while preventing unnecessary loss of resources.

Hazards Prevention: A combined approach to hazards protection and resource conservation simplifies the process of management -- i.e. making decisions on the acceptability of development proposals through environmental assessment -- and leads to more balanced decisions on what constitutes acceptable development. Note that the same setback requirement that protects beachfront structures from erosion and storm waves can also preserve turtle nesting sites on the back beach. Similarly, a restriction on clearing of mangrove swamps will not only conserve an economically valuable resource, but also maintain a physical defense against storm waves (26). In a final example, a seashore or coral reef park could be established to protect these natural landforms and serve the objectives of both hazards prevention and natural resources conservation (69).

In the Strategic Plan, recommendations should be made about inclusion of natural hazards prevention in the CAMP program. As before, there are benefits and disbenefits to be expected from inclusion. But if no other governmental agency is dealing with the subject of maintaining natural storm defenses, CAMP should.

Pollution: The Strategic Plan should recommend the level of involvement that the CAMP program would have with pollution control. Most countries have an existing agency to handle pollution and other environmental quality matters. Whether any of the coastal pollution control functions should be transferred to the CAMP program will probably be the major question. The answer depends upon the individual circumstances; there are advantages and disadvantages of incorporating pollution control in CAMP programs.

Value of Strategic Planning: The CAMP strategic planning process for coastal conservation may seem innovative and it certainly is distinct because of its subject, but strategic planning for economic purposes is common, particularly in countries with centrally planned economies and large corporations

Box 4.5

The Strategic Planning Process in Nature Protection

The strategic planning process provides the planner with means to rise above the details and grasp entire ecosystems. Trees are envisioned as elements of forests; fish are elements of complex water columns. Through the use of these means, the areas of land or sea which merit special forms of management to sustain human development and environmental stability can be identified. The ways, places, and time periods when certain development alternatives will involve negative or positive impacts for the environment can be noted.

The process by which strategies for the conservation of marine, as well as terrestrial, resources can be planned consists of six interrelated and interdependent planning functions. In the planning stage, these functions may be considered as sequential steps. Later, when a strategic system has been set up, they are to be carried out together:

Function 1. Gather information relevant to the extent and status of marine resources and the problems and issues related to their protection and use. Store the information in a manner useful for, and easily retrieved by, interested users.

Function 2. Verify and gather additional and detailed information in the field. Study areas which are representative of resource types and particular problems to gain relevant field experience.

Function 3. Analyze information to determine concentrations of living resources, the nature of ecological processes important to major species and productive habitats, and locations where present or potential human activities are concentrated. Synthesize the results of analyses to show where potential conflicts and/or compatibilities lie. Present information to guide interested organizations and individuals on strategies for conservation action.

Function 4. Determine priorities for action to address the key problems and issues pertinent to support systems for humans and other species of the Region, and those related to possible conflicts between human activities and natural resources.

Function 5. Implement activities through agreements, conventions, and field projects, as appropriate, and in collaboration with other institutions and individuals, to solve problems and issues.

Function 6. Monitor agreements, field projects, and the program as a whole to learn from real-world experience and to improve the efficiency of future project and program operations. Monitor the status of the marine and coastal environment in the Region on a continuous basis to provide a periodic updating of information, knowledge, problems and issues, and their analysis and synthesis.

Source: Kenton R. Miller (Ref. No. 53)

with diversified activities and holdings. In regard to corporate strategic planning, Michael Porter (65) comments:

> Strategic thinking rarely occurs spontaneously. Without formal planning systems, day-to-day concerns tend to prevail. The future is forgotten. Formal planning provided the discipline to pause occasionally to think about strategic issues. It also offered a mechanism for communicating strategy to those who had to carry it out, something that seldom happened when the formulation of strategy remained the private province of the chief executive.

Strategic planning has long been recommended for countries considering national systems of marine and coastal parks and protected areas (69). Kenton Miller (53) discusses the advantages below (also see Box 4.5):

> Strategic planning for the maintenance of living resources examines the major overall problems facing species, communities, people and life support systems. It focuses upon the requirements for ensuring the long-term maintenance of species and habitats while assuring the flow of short and immediate-term benefits. Strategic planning reviews major trends, analyzes the relevant factors, synthesizes the relationships among key factors, and identifies priorities for action. In addition, and to keep the planning process up-to-date and on target, strategic planning periodically reviews all field activities which have been derived from the strategy in order to glean learning from experience, and to constantly revise the information upon which planning is based.

Regionalized Approach: It may be appropriate to emphasize a regionalized CAMP program rather than a national one. However, it must be understood that regional CAMP programs cannot exist without national government participation because national governments usually retain most of the authority for management of water bodies and oceans (the wetside). The regional emphasis arises from the issues orientation of CAMP programs; the issues are often seen as distinctive to particular regions and therefore the resolution of the issues is also seen as a regional matter. For example, if beach erosion, oil extraction, port development, or mangrove cutting problems affect only one region of a country, then the search for solutions is seen as meeting a regional need, not a national one. The regional emphasis is quite compatible with the CAMP approach, being a region-by-region incremental implementation of a national CAMP program. (see Box 4.6).

The regional emphasis involves an approach to CAMP strategic planning that resembles standard regional economic development planning, but with the focus on a limited, and distinctive, and very important area (see Chapter 3, section

Box 4.6

Coastal Resource Management (CRM) status in Indonesia

The main problem with existing CRM in Indonesia [in 1986] is that a central integrated and coordinated program has not yet been established, although the basic legislation has been passed, the lead ministry identified (Population and Environmental Affairs) and a coordinating committee among the ministries proposed. Single purpose sectoral projects advocated by one line ministry (or subordinate counterparts at provincial or kabupatens level) presently do not consider the adverse CRM and environmental effects and can conflict with the programs of other ministries (or subordinate equivalents). As a consequence, poor, uninformed, decision making results, and coastal use options are unnecessarily compromised and resources lost.

The goals of a CRM program would be to provide the framework for resolving conflicts among single purpose proposals in a specific region, by evaluating the consequences of individual projects on other activities and selecting alternatives that maximize multiple and compatible use and minimize unnecessary foreclosures of option or losses to coastal resources. The following components should be included in the program: policy and plan formulation, training, research and development, pilot-level implementation, dissemination of information, periodic adjustment of program goals, and gradual expansion of the program throughout the provinces of the country.

All the above components would be a part of both national and provincial initiatives, but most of the actual management and decision making would occur at the provincial level while most of the important policies and guidance including those of national significance would be developed and monitored at the national level. The above components also serve as the general sequence for program evolution.

Policy and plan formulation would refine existing policies, develop new ones, and develop implementing procedures (regulations). Coordination with conservation and development agencies would be accomplished until an integrated national plan and process is adopted. Gradually this would filter down to the provincial level. After specific regional plans and a process is established, day-to-day CRM would be initiated at the provincial and lower levels.

Source: P.R. Burbridge and J.E. Maragos (Ref. No. 12)

3.4). Nevertheless, a wide array of government agencies, economic sectors, and public interest groups may be involved.

The proposed CAMP-type program for Ecuador is an example of a well planned regionalized approach. Four specific coastal regions have been designated as regional CAMP units, termed "Special Management Zones" (49). Each of these units -- one is proposed for each of the country's four coastal provinces-- would have a separate Advisory Committee composed of government and private sector representatives. A special effort would be made in each region toward coordination and enforcement of existing regulations -- it is believed that sufficient regulations already exist and that the major task of the CAMP-type program is seeing that they are enforced appropriately (49).

CHAPTER 5. PROGRAM DEVELOPMENT AND IMPLEMENTATION

5.1 Introduction

Program development is the third stage in the four-stage CAMP model described herein. Like any structural model for governance, this model's value is more instructive than prescriptive. Each country will have to choose a form of CAMP structure that is most suited to its own program development needs.

This chapter describes the process involved in shifting from the strategic to the tactical mode; that is, in moving from the strategic planning stage (stage 2) to the implementation stage (stage 4). If in fact, the Strategic Plan has achieved consensus of a wide range of interests, the present stage, Program Development, should be less troubled by interest group intervention and more free to concentrate on important administrative and technical matters.

Detailed technical material for program development is given in the three earlier publications in the "Coastal" series , as follows: No. 1, "Institutional Arrangements for Management of Coastal Resources", No. 2 "Coastal Resources Management Guidelines"; No. 3, "Coastal Resources Management: Development Case Studies" (refs. 75,73,21). The reader is referred to these publications for details; here we emphasize the processes involved in program development rather than detailed substance or technical materials.

5.2 Management Mode

One of the more difficult aspects of CAMP is getting authorization to move the program from strategic planning into the management mode. If the program appears too complex, too controversial, too disrupting, or too expensive, the government may stall at the planning stage rather than move to management. Therefore, CAMP advocates must avoid unrealistic goals and excessive complexity. On the other hand, a government might find an adequate substitute for a special CAMP-type program. An example of the latter is Trinidad and Tobago which decided after considerable study that a special CAMP agency was not justifiable and that the existing national planning agency could satisfy the need without special legislation; scientific assistance was to be provided by a major marine research station (52).

Another example of using existing authorities rather than passing new coastal laws, is the Australian state of Western Australia where the CAMP strategy is to keep the land adjacent to the edge of the sea in a State Reserve and not "alienate" it for

private purposes. The effect of this linear coastal reserve is to provide a buffer strip (of undeveloped public land) between the high water line and the developed part of the shorelands (60). In this manner, development does not crowd into the "edge zone", the most valuable of coastal critical areas (see Principle 4). This coastal "linear" or "buffer strip" reserve program, as a non-statutory approach to CAMP, requires extensive coordination of agencies and optimal use of existing governmental powers.

Program Scope: In concept, CAMP can be as simple as a program of impact assessment for development projects, or as complex as a comprehensive, full service, program of economic development, conservation, education, and social well being. In Chapter 4, we listed the minimum elements for a CAMP management operation as: 1) a central government coordination office, 2) a project review (environmental assessment) system for major coastal developments (see Principle 15), and 3) a capability to ensure compliance with established standards. In this minimal mode, it is anticipated that the program would mainly review developments and issue permits for acceptable projects. If the decentralized, or regionalized, CAMP program is chosen (see subsection 5.14), elements 2 and 3 would be shifted to each of the operating regional CAMP units.

In an expanded mode, the CAMP program would broaden out to include additional functions needed for a more complete program. Examples of some of the more valuable additional functions are listed below:

- Technical services: planning, information management, survey and mapping, monitoring, research, economic analysis, and technical advice to developers, government agencies, and interest groups.

- Education services: information dissemination, public education, staff training, extension services.

- Guidelines: formulation of standards and guidelines for coastal development, and publication and update of the standards and guidelines.

- Restoration activities: assessing the state of coastal renewable resources, determining restoration needs, designing restoration projects.

- Protected areas: determining the need for the establishment of a system of parks, reserves, or other types of protected areas, priorities for site selection, creation of management plans.

Orientation: CAMP programs should be founded on basic planning and management principles, such as the 15 Premises and

Box 5.1

Philippines CAMP Strategy

The following 12 items, listed as "strategies and targets" for the "enhancement of the coastal zone" of the Philippines show how important the information component is in a CAMP-type program:

- Generation of baseline information about coastal zone resources
- Identification of the present status of coastal resources and utilization, institutions and policies
- Identification of specific environmental problems in the coastal zone
- Continuous inventory, monitoring and assessment of coastal zone components
- Establishment of a system of coastal zone data storage and retrieval
- Development of coastal zone management expertise in the country
- Organization of training programs, forums and symposia where relevant issues in coastal zone management are discussed
- Dissemination of information about the importance of the coastal zone through an environmental education approach
- Rehabilitation and development of coastal resources and features
- Investigation of non-productive coastal environments
- Formulation of guidelines and legislation for the implementation of the coastal zone management plan
- Delineation of the responsibilities of government agencies related to coastal zone management

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Source: "National Environmental Enhancement Program" (Ref. No. 56)

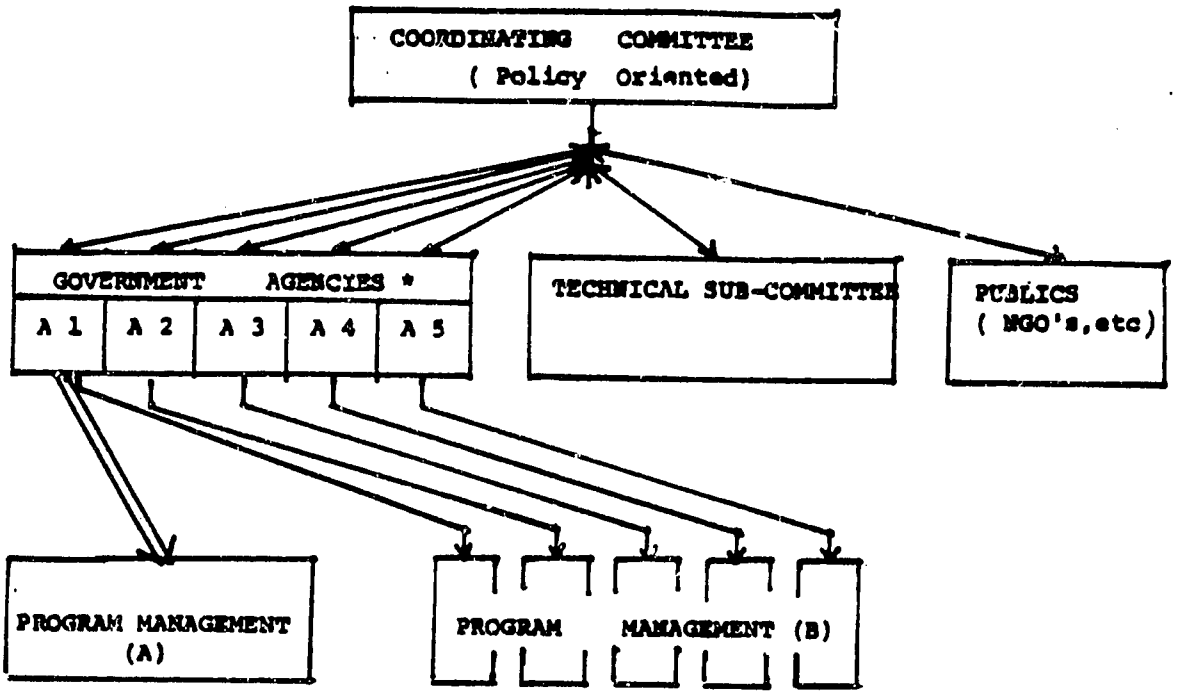
Principles of Chapter 3. These 15 are applicable to most countries and most forms of government because they express the fundamentals of natural processes and of governance systems.

It is important to recognize that CAMP is oriented more toward management of development than to management of resources. To explain the difference, we use the example of fisheries. In most countries there is a department of fisheries which has responsibility for the management of coastal and marine fish stocks (as common property resources). This department implements conservation by prescribing closed areas for fishing, closed seasons for certain species, prohibitions on certain methods of fishing, and certain other controls. CAMP does not preempt this resource management role. Instead, it supplements and enhances the work of the fisheries managers by controlling coastal development and resource uses (such as coral mining) which conflict with fisheries and which could have an adverse impact on fish stocks and particularly on the critical habitats which provide life support for fish species.

An example of a critical habitat for fishes and shellfishes is the mangrove forest (see Chapter 2). CAMP attempts to prevent obliteration of mangrove forests by constraining excessive mangrove clearing and other destructive development activities which are unreasonable and have a long term net negative effect on both the coastal economy and the welfare of coastal people. This ability to review coastal development projects -- through environmental impact assessment -- and to effectively oppose or alter the bad ones, usually does not exist in fisheries departments. An exception is Sri Lanka, where the national CAMP program was assigned to the fisheries department. But the integrated, centralized, coastal management operation will usually be a special function placed in a special CAMP agency or office, either a coordinating entity or a separate management agency. These two organizational options are illustrated in Figure 5.1.

One example of the first option of Figure 5.1 is the CAMP regional unit plan for the Greater Capital Area of Oman, which recommends a lead agency only for coordination with management responses allocated to appropriate "line agencies", a process that is often termed "networking" (see Box 5.1).

It should be understood that CAMP programs do not preempt existing resource management functions of government agencies but, instead, aid and abet them. In fact, some state CAMP programs in the United States explicitly separate development management from resources management (see Box 5.2).



Management Alternate A

Whereby one agency manages the coastal program (including,where appropriate, staff secunded from the other agencies).

Management Alternate B

Whereby each agency manages components of the coastal program, guided by it's designated coordination officer.

Figure 5.1. Two alternative institutional arrangements for administering a CAMP-type program. (Source: ref. no. 58)

Box 5.2

Development vs. Resource Management in Alaska, U.S.A.

In Alaska, local governments develop coastal management programs under State guidelines and standards. The Act sets up a Coastal Policy Council to oversee the development of such programs and to resolve conflicts during their implementation. Approval of local programs, however, requires action by the State legislature in addition to the Coastal Policy Council.

The Council has issued, and the State legislature has adopted, guidelines and standards for the following categories of coastal development uses and activities:

- coastal development
- geophysical hazard areas
- recreation
- energy facilities
- transportation and utilities
- fish and seafood processing
- timber harvest and processing
- mining and mineral processing
- subsistence

In addition, there are also official State guidelines and standards for resource management including inventorying and managing such habitats and ecosystems as:

- estuaries and lagoons
- wetlands
- tide flats
- rocky islands
- barrier islands
- rivers
- offshore areas

Source: John T. Sun (Reference No. 77)

5.3 Boundaries

CAMP is a management and planning program that applies to a specific area, the coastal area, or coastal zone. Consequently, it is necessary to delineate the area of CAMP jurisdiction by specifically, and legally, defining the coastal zone (see Principle 7). The boundaries should be based upon the issues to be addressed in the CAMP program; i.e. the problems to be solved by CAMP exist within a certain area and this area can be defined as the coastal zone for either a nationwide program or a regional (subnational) program (Figure 5.2).

It may be useful to subdivide the coastal zone into management subunits, or tiers, that are compatible with existing natural and political boundaries, as for example: (19)

Tier 1) Marine and coastal waters -- The open water part of the coastal zone beyond the transitional area of wetlands, tide flats, etc.; permanently submerged resources. High level of central government interest and authority.

Tier 2) Transitional area -- The edge of the sea which is intertidal may include coastal lowlands subject to flooding during seastorms as well as intertidal mangroves, tideflats and beaches. Central government interest; high level of interest regionally and locally.

Tier 3) Shorelands -- The lands directly adjacent to the transitional area which generate significant impacts to coastal resources; high value for many purposes; urban waterfront development usually disrupts the edge zone and generates pollution. High level of local interest.

Tiers 1 and 2 cover the "wetside" of the CAMP program while Tier 3 covers the "dryside". A fourth tier should be added to include "uplands", if the CAMP program is designed to address the effects of watershed clearing and soil erosion, pesticide or herbicide runoff, and alterations of hydroperiod caused by dams and reservoirs. Even if uplands are not identified as a management subunit, or tier, impacts from upland sources should be considered in the CAMP program (see Principle No. 3).

For planning, it is advisable to delineate a broad area, including all the shorelands; e.g. fringing islands of the coastal plain, the various coastal settlements, industrial areas, and agricultural lands as well as the transitional areas of the

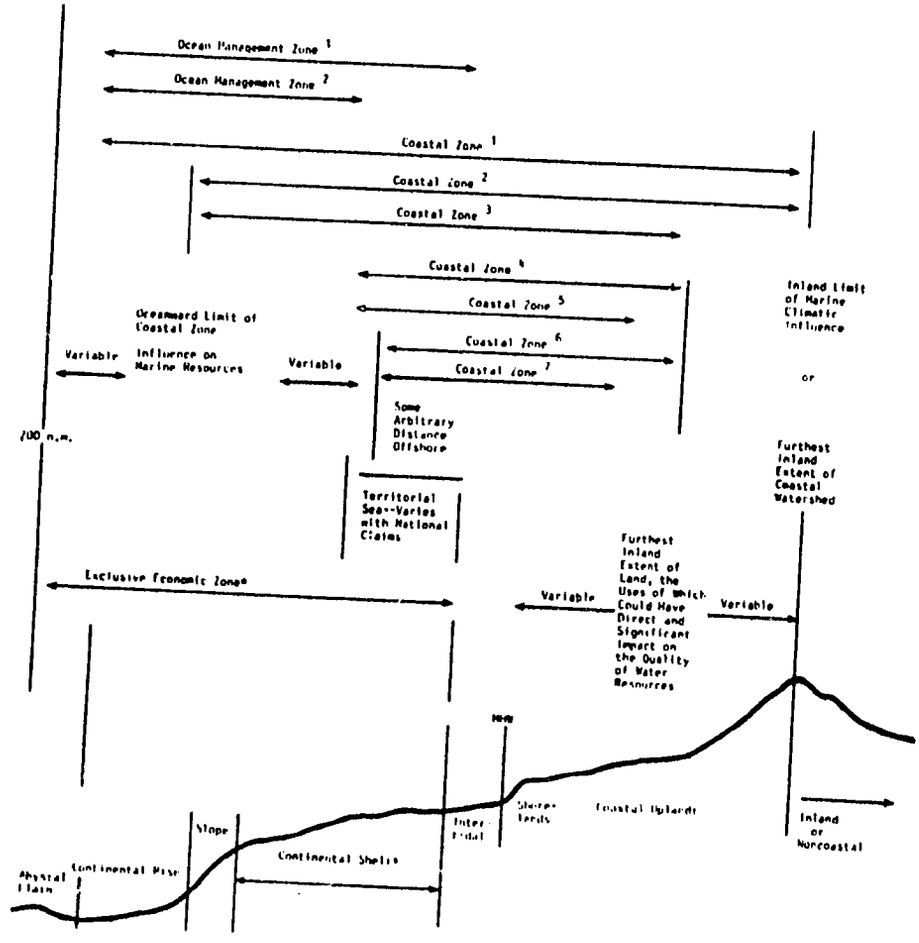


Figure 5.2. Relationship of coastal zone and ocean management zone to coastal environments and ecosystems, showing the variety of zones to consider in establishing CAMP boundaries.(Source: ref. no. 75)

edge zone and the open waters. A broad planning area has the advantage that planners can look synoptically at all the resource uses and economic and social factors that relate to coastal conservation.

Conversely, for **management** the boundaries should be as narrow as feasible (see Principle No. 4). The narrower the management area, the more authority CAMP management can expect to gain. The broader it is, the less authority it can gain because of the increased conflict with other government authorities and the appearance of vagueness of function.

It is in the third tier of jurisdiction -- the dryside-- where the most difficulty will arise because here all the problems of governance are met -- crime, housing, transportation, taxes, waste disposal, etc. -- not just coastal resource problems. But, this is not to say that the dryside should never be included; indeed, the focus of the U.S. Coastal Zone Management Program -- control of waterfront development -- is on the dryside. Therefore, if it is a major purpose of the proposed CAMP program to control waterfront development in shorelands adjacent to the edge, tier 3 should be delineated to accomplish that purpose.

For the inland boundary of the planning area, it will be convenient to use a major highway paralleling the coast, the foot of a coastal mountain range, or the inland boundary lines of the coastal counties or municipalities, or other recognized political or physical feature. This will be more practical than an arbitrary distance of 100 m, 1 km, or etc. as is done by some U.S. states (e.g. Washington and Connecticut). This "practical" type of planning area boundary is most convenient for regional planning and social demographic and economic analysis as well as for defining interest groups.

5.4 Coordination

Because all levels of government must be involved in CAMP (see Principle No. 8) along with development interests and resource users (see Principle No. 13), the job of coordination with the variety of "stakeholders" is complex and important. The decision-making and implementation processes must be shared among these interests, requiring efficient communication and effective dialogue. Information sharing is specially important. Public hearings or consultations may be appropriate in advance of particularly important decisions.For most programs it will be desirable, if not essential, to establish an "interagency coordinating committee" to review progress, consider program changes, discuss proposed new rules, to receive advice, and to consider actions on specific development applications and resource management proposals (see Figure 5.1) The benefit of widening the involvement in CAMP beyond government agencies to

Box 5.3

Involving local communities in CAMP

Implementation of management programs is not and should not be an entirely governmental responsibility. Resource management objectives can be pursued by local communities, resource user groups, schools, and other formal or informal collectives. For example, fishermen's cooperatives have proven to be extremely effective tools for implementation of development objectives in Guyana, Nevis and Barbados. Government has provided incentive, but the organization has remained non-governmental. Often, local communities and resource users have developed management techniques to sustain their traditional resource use, and these techniques can be exploited... Government regulation, on the other hand, can often make the resource user feel out of control of his destiny and out of touch with his environment.

To a particular community, their special problems may have more importance, and government's inability to see their situation can be frustrating. Communities can resolve many of these special problems themselves by freely exchanging ideas and information and working towards commonly acceptable solutions. Government can assist by being a receptive part of this problem-solving process, working to understand the problems of individual groups, and supplying technical or institutional assistance to encourage local efforts.

Particularly in rural communities, many people do not receive wages or salaries, but rather depend on activities like subsistence fishing, small scale farming, or trade for their survival. An increase in the per capita income is unlikely to affect these people; development for them means increased ability to carry out the activities on which they rely. Actions that close options off by concentrating on purely economic development can wind up creating more problems than they resolve. When, for example, commercial fishing is developed to the point of squeezing out the subsistence fisherman, the net result to the community can be negative, despite apparent economic growth.

Source: Tighe Geoghegan (Reference No. 34)

include the public is particularly stressed for small island countries such as those in the Caribbean (see Box 5.3).

The CAMP authority must have influence on a wide range of ministries and agencies -- e.g. finance, agriculture, economic planning, commerce, tourism, forestry, and transportation -- and often take a position on coastal development or conservation that is adverse to one or more of them (Figure 5.3). As Joliffe has said: "It cannot be assumed that diverse authorities, such as government departments, local government authorities, conservation agencies, port and harbour authorities, water and river authorities, and many others, will, without prodigious effort and goodwill, coordinate their policies in relation to coastal problems" (44) (see Box 5.4).

Without exception, institutions will defend their turf and yield authority and prerogative grudgingly. Getting institutions to cooperate in multi-sectoral activities toward CAMP goals that no single institution can accomplish singly is certainly one of the toughest jobs for the CAMP authority. Without extraordinary delegation of authority -- i.e. above the level of the individual ministries or departments of government -- CAMP success will be minimal.

Few countries will have an interagency, or interministerial, entity already in existence which is positioned to take on a CAMP program. Therefore, a lead agency with an interagency mandate will usually have to be created to accomplish the coordinative management, and planning functions of CAMP. As Joliffe states the case: "...what is quite clear is that existing planning and management agencies are essentially land or sea-based and that the littoral zone normally marks a jurisdictional boundary rather than the vital focus for coastal planning and management." (44).

The CAMP office within the lead agency should be mandated, staffed, and budgeted to accomplish at least the minimum three tasks listed in Chapter 4: 1) inter-institutional coordination on coastal resource conservation matters, 2) review and comment on all major coastal developments, and 3) compliance with CAMP rules and decisions. Other tasks that may be added as possible to build a full-service CAMP operation are described further on in this chapter.

5.5 Project Review and Environmental Assessment

At the center of the development review and control process is the formal assessment of impacts predicted for specific projects -- the "environmental assessment" (EA). The information and analysis generated in the EA provide the basis for the decision on whether a coastal project is disapproved, approved as is, or approved with conditions attached. Lately it has become common to include economic and social considerations as part of

Box 5.4

Oman. An Example of the Multiple Jurisdiction, or Networking Approach to CAMP

The success of any plan that implicates different ministries, as this Coastal Zone Management Plan (CZMP) for Oman does, depends on two principal factors:

- information exchange and cross-sectoral review; and
- effective coordination for plan implementation.

A lead agency should assume primary responsibility for coordinating these two tasks. Since the Ministry of Commerce and Industry has commissioned this CZMP, it is assumed that this responsibility should rest with them. However, certain specialized tasks relating to the management of the various resources fall directly into mandate of other ministries which should assume that responsibility for them.

Thus, in the CZMP recommendations, tasks pertaining to different activities are assigned as follows:

- land use policy, planning, and allocation: to the Ministry of Housing
- recreation and tourism policy, planning and management: to the Ministry of Commerce and Industry through the Department of Tourism
- fisheries support systems management: to the Ministry of Agriculture and Fisheries through the Directorate General of Fisheries
- implementation of environmental policy: to the Ministry of the Environment and Water Resources
- protected areas management: to an existing management authority in the Capital Area pending acceptance of implementation of recommendations of IUCN Project 9069
- control of roads, harbors, and coastal works: to the Ministry of Communication
- site implementation of policy: to the Capital Area Municipality and the Ministry of Regional Municipalities throughout the respective municipalities
- enforcement of environmental and species protection regulations: to the Royal Oman Police

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Source: Adapted from Rodney V. Salm (Reference No. 70)

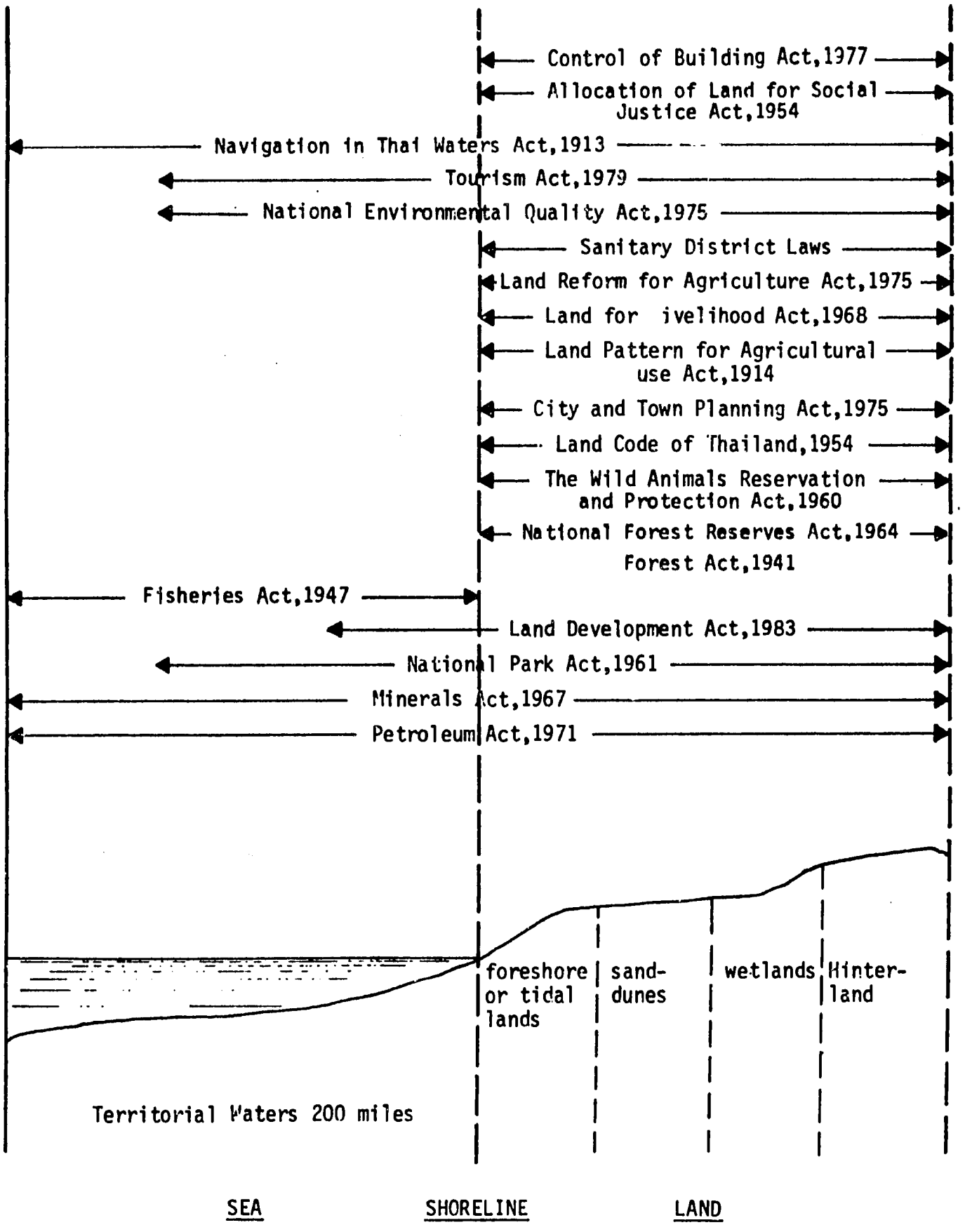


Figure 5.3. Legislative administration of the coastal area of Thailand. An example of the multiplicity of jurisdictions that operate in coastal areas. (Source: ref. no. 5)

the assessment. Nevertheless, it is still usually termed an environmental assessment (EA).

The EA used for coastal zone development projects is generally the same as the standard terrestrial or marine EA, about which there is an extensive literature. Sources that are particularly good on methods for EA include: Maragos et al. (48), Thompson (78), Ahmud and Sammy (3), Beanlands (6) and Gammon and McCreary (18).

While EA is an essential component of the CAMP development management component, any of a variety of techniques is adequate, including: checklists, matrices, networks, map overlays, or numerical evaluations (6). The EA protocol can run anywhere from a five to a ten-stop procedure; the following six step procedure would be quite satisfactory for CAMP purposes (modified from reference 48):

1) Data gathering on project characteristics (design, location, etc.), alternatives, and coastal resources to be affected, including existing uses of these resources;

2) Estimates of the negative (and positive, if any) environmental impacts likely to follow development;

3) Identification of designs, locations, and precautions to prevent avoidable negative impacts;
4) Identification of measures to reduce the effects of unavoidable negative impacts;

5) Identification of mitigation opportunities such as habitat rehabilitation, to offset unavoidable negative impacts;

6) Recommendations to decision makers on the best combination of measures and alternatives to minimize and/or mitigate impacts.

Maragos et al. (48) give an excellent summary of generic types of data needed for assessment of development projects as well as review of data collection methods which CAMP organizers should heed (see Table 5.5 of reference 48). They also stress the importance of concentrating on the primary goal of the assessment process which is to avoid or reduce significant adverse impacts of development. Most development involves several phases: preliminary feasibility studies; selection of a plan and detailed engineering and design; construction; operation; and decommissioning of facilities, if applicable. Throughout the assessment and planning process, there will be an accumulation of physical, ecological, and other environmental information. In time this information normally progresses from general,

qualitative, and extensive in character to detailed, specific and quantitative. Although qualitative information is invariably required for all types of development, the choice of alternatives to be implemented dictates to a great extent the need for quantitative information. Often the need for expensive quantitative data gathering can be avoided if the project proceeds in a direction that minimizes adverse impacts (48).

According to recent expert opinion, economic and social impacts should be incorporated into the EA. One expert, P. Burbridge recommends that, in practice, ecological and economic impacts should be jointly evaluated. With increased perception of ecological functions it is possible to improve the economic expression of their value to society. For example, mangroves, once thought of as worthless swamps, unless developed for a major single purpose or converted to make shrimp ponds, are now seen as extremely valuable resources capable of supporting a variety of activities.

To assess the merits of alternative forms of development, it is necessary to consider the economic value of the products and services produced by the systems and how they would be affected be development schemes (a distinction is made between an economic analysis which requires that economic factors external to the physical system be included and a financial analysis which would normally ignore such factors) (10).

Economic assessment of coastal systems is often made difficult, but not impossible, by two separate phenomena according to Burbridge (10). First, many of the products and services they provide are not easily expressed in monetary terms. Second, many of the products and services are of benefit to people at some distance from the system itself and must be treated as external to the location or site of the physical system. These two phenomena can be illustrated by Figure 5.4 where a mangrove system is used as an example.

The figure demonstrates that the products and services produced by the mangrove forest can be divided into four categories based upon whether they are utilized within or outside the physical system (on-site versus off-site), and whether they are priced and exchanged using conventional market mechanisms (10). Using this method of analysis it is relatively simple to demonstrate that some goods, such as mangrove timber, will be extracted on site and can be easily valued be observing their value in a local market. Other goods (such as fish that depend on mangrove for some part of their life cycle) may be obtained at some distance from the site and sold through a market, so their value is also relatively easy to demonstrate. The most difficult category to value are the products or services that the mangrove generate but that occur off-site and for which people do not normally pay. For example, the reduction of storm damage

		Location of Goods and Services	
		On-site	Off-site
Valuation of Goods and Services	Marketed	**1** Usually included in an economic analysis (e.g., poles, charcoal, woodchips, mangrove crabs)	**2** May be included (e.g., fish or shellfish caught in adjacent waters)
	Nonmarketed	**3** Seldom included (e.g., medicinal uses of mangrove, domestic fuelwood, food in times of famine, nursery area for juvenile fish, feeding ground for estuarine fish and shrimp, viewing and studying wildlife)	**4** Usually ignored (e.g., nutrient flows to estuaries, buffer to storm damage)

Figure 5.4. Relation between location and type of mangrove goods and services and traditional economic analysis.(Source: ref. no. 36)

resulting from mangrove acting as a buffer to waves and wind (10).

If economic analysis is done carefully it is feasible to incorporate the full range of products and services and to demonstrate their value in either explicit monetary terms or in a qualitative manner which is fully defensible. The goal of an economic analysis is to help decision makers to identify all the relevant factors and to assess the benefits versus costs to society which will result from different management alternatives (10).

Of the greatest economic importance is maintaining bioproductivity for fisheries. Here is an obvious example of an ecological process directly affecting people's well being. Naturally productive ecosystems, such as estuaries, provide free of cost what expensive mariculture can barely match - continued fish production. Continued fish production means continued livelihood for fishermen and for others in the fishing industry, including boat builders, trap and net makers, packers, distributors, and retailers. Finally, continued livelihood means continued social, cultural, economic, and political stability (69). Therefore, the benefits of any project which creates negative impacts on fish habitats should be critically weighed against its long term detriments to fisheries.

The assessment of the social impact of development is an important part of the planning and evaluation process (28). It is a vital part of environmental impact assessment because people live in the environment right along with other flora and fauna. Environmental changes affect people; people in turn affect their environment. In addition, it is within the context of human action and reaction that all impacts are assessed.

Social impact assessment (SIA) is a way of trying to figure out what will and what does happen to people, their organizations, and their communities as a result of a particular change. It involves the use of social science techniques to make predictions, monitor, and evaluate outcomes. It is an anticipatory endeavour in its predictive role and a continuing endeavour in its monitoring and evaluating role. The primary goal of SIA and assessments generally is to facilitate decision-making by determining the full range of costs and benefits of alternative proposed courses of action (28). The most important secondary goal is to improve the design and administration of policies in order to ameliorate the disbenefits and to increase the benefits (see Box 5.5).

Box 5.5

Social Feasibility of Coastal Aquaculture

In the context of working with coastal communities to develop appropriate aquaculture systems, the following aspects of community structure and institutions appear to be the most important:

- informal and formal institutions, especially those of a legal nature that govern property or use rights;
- sources of wealth (productive assets) and degree of concentration of ownership;
- male and female labor use patterns and availability
- extent of collective action and strong leadership;
- previous experience with and reaction to technological change in aquaculture or other community activities;
- present skill levels, both technical and managerial; and
- extent of linkages with external institutions, including credit, extension and markets.

In most instances, technology is a two-edged sword. While it can potentially liberate and add to general community welfare, it frequently does so at the cost of established socio-cultural values, community structures and institutions. In the case of coastal aquaculture, however, two major factors must be kept in mind with respect to this issue:

1) The vast majority of residents in coastal communities are desperately poor. They are poor because of their lack of access to alternative employment opportunities and because existing community and national structures and institutions most often allow local elites to capture the bulk of any benefits that come from more productive technologies introduced to or adopted by such communities.

2) The common-property nature of the coastal zones's resources, especially mangrove areas, is being rapidly eroded by the conversion of much of these areas to private fishpond use. This use and misuse of the coastal zone is made possible through subsidized financing and institutional arrangements that favor the large-scale private or corporate investor over the small-scale, perhaps communal, investor.

The above two factors imply that for the majority of residents in the coastal zone there is nothing particularly beneficial in existing community power structures and institutional arrangements. Most often, those communities have experienced only the negative aspects of this technology; for example, in the form of large-scale trawlers that have led to the over-exploitation of may coastal fishing grounds. What has been missing in much of their experience to date with technological advance is an element of community control over its development and use.

Participatory development on the part of coastal communities will require conscious efforts to involve them in the process of aquaculture development; it certainly will not come about without efforts to decentralize control and decision-making over the coastal zone itself and the technologies that are appropriate there. Nor will participatory development come about without efforts of interested researchers, extension workers, rural bankers and non-governmental community developers to make certain that communities are directly involved and supported over the long term.

Source: Ian Smith (Reference No. 72)

A procedural framework for this process may include:

Profiling - Identifying existing conditions, providing a baseline.

Projecting - Predicting likely changes and their effects (e.g., by utilizing results of research on similar areas, extrapolation of trends, or development of scenarios).

Assessing - Determining the importance of the effects and ways of avoiding or mitigating them.

Evaluating - Considering the acceptability of the impact of the project and its alternatives.

To follow this procedure, a wide array of social science techniques may be helpful. The difficulty lies in finding an appropriate design and utilizing or developing the best techniques available (28).

Whether the review process is very simple or very complex, without it there can be no effective CAMP program -- there has to be a systematic way to review project impacts, to modify them to reduce negative impacts on resources, and to reject the worst of them. The reason that EA works best for conservation objectives of project review is that this process has been used for over 15 years and its principles, practices, methodologies, and limitations are well known, there is a large literature on it, and training in the EA field is easily available. Also EA is very compatible with CAMP program structure.

For environmental assessment to include major "externalities" generated by the project, the boundaries should be broad enough to incorporate all of the major effects of the project (75). For example, a mangrove conversion project would have analytical boundaries broad enough to include the expected benefits and costs that occur off-site; examples of such benefits or costs are changes in coastal fish catch from conversion or destruction of mangrove-based food chains or changes in saltwater intrusion, drainage, or storm surges following conversion (75).

For EA to be effective there must be standards and guidelines to which all interested parties can refer. Some general guidelines are given in subsection 5.15 for reference. There must also be permit system whereby project sponsors must get formal permission to proceed with coastal development, a requirement of which is that an EA is conducted to evaluate and approve the project. This should pose no administrative problem to most countries because they will have already had considerable experience with permit processes.

5.6 Critical Areas

It will be most helpful to the CAMP program development process to identify the special coastal habitats that are to be given a high degree of protection. Detailed information on them should be provided to all interests, particularly to resource users like fishermen, the public and the private development community. It should be recognized that in the administrative context, there are two types of critical areas:

1) Generic types of habitats that are widely recognized as highly valuable and that should be given a high degree of protection through regulatory mechanisms--wetlands, seagrass meadows, coral reefs, species nesting sites. In the CAMP process of project review, developers would usually be told to avoid these types of habitats; therefore, developers should be informed ahead of time ,before they design projects, that restrictions exist. In addition to ecologically critical areas, other types of areas should be identified, such as sand dunes (which stabilize beaches) and flood-prone lowlands (those that are regularly flooded) both of which would be categorized under the natural hazards prevention category.

2) Specific habitats or environmentally sensitive areas (ESA's) that would be identified as areas qualifying for regulatory protection as "environmentally sensitive sites". These would include certain lagoons, estuaries, islands, mangrove forests, river deltas, coral reefs, etc. Each would be described, mapped and announced for the knowledge of all interested parties. The ESA's would be given special consideration for protection by the CAMP authority as "red flag" areas in the development review process.

A third administrative category, parks and protected areas, is discussed in the next subsection; these are addressed separately because parks, reserves, and other protected areas are an existing, traditional, and well recognized governmental function in most countries. Therefore, it is better for a new CAMP program to coordinate with this function rather than try to incorporate it. On the other hand, in most countries, protection of generic habitat types and environmentally sensitive sites (ESA's) are not being attempted in a systematic way and CAMP intervention might be quite beneficial (see table 5.1).

An area would be categorized as "environmentally sensitive" and listed as an ESA if: 1) it contained an outstanding example of one of the generic habitats, or 2) it contained two or more of the critical habitats that individually were not outstanding but in combination created a major coastal or marine ecosystem, or 3)

Table 5.1. Some Coastal Habitats and their Environmental Vulnerability (Source: modified from ref. no. 16)

(A) Littoral habitats	Vulnerability index
1. Saltwater swamps (Mangrove swamps) shallow; intertidal; soft bottom, muddy, sandy mud; biologically productive; tidal influence; salinity – 25%.	10
2. Freshwater/brackish-water swamps (Nipah, mangrove & nipah swamp) shallow; partially intertidal; soft bottom, muddy, sandy mud; moderately productive; tidal influence reduced; salinity – 1 to 25%.	9 – 10
3. Mudflats shallow, usually exposed at low tide; muddy or sandy mud bottom with fine silt; biologically rich; tidal influence; salinity variable – 20 to 30%.	8 – 9
4. Beaches sandy; intertidal; high wave energy; salinity – >32%; biologically non-productive.	2 – 3
(B) Sublittoral habitats	
3. Marine influenced lagoons depth 3 to 15 feet; margin of lagoon shallow & exposed sea water inlets; biologically rich; salinity to 29 to 33%.	7 – 8
4. River influenced lagoons shallow, 3 to 6 feet deep; soft or sandy; freshwater influence; wave action negligible; salinity 1 to 15%.	5 – 6
5. Bays shallow, 3 to 6 feet; soft bottom with mud & silt; salinity 25 to 33%; tidal & wave influence.	4 – 5
6 Open coast deep; below low tide level; high wave energy; turbulent; shifting sand; salinity >33%	1
7. Coral reefs moderately deeper water >20 feet; seldom exposed, high energy; marine salinity – 34%	4 – 5

had other outstanding characteristics. In practice, the identification process would proceed in the following order: 1) identification of generic habitats to be given protection nationally (regionally, if a regional CAMP program), 2) delineation, listing and evaluation of sites that qualify as ESA's and that would receive special regulatory attention, and 3) select from the list of ESA's, those that should receive the highest level of protection through custodial means as protected areas (custodial protection implies that the government has title to the area under protection).

The result would be a single integrated set of "environmentally sensitive sites" for the entire coast which then would be sorted out for two different kinds of protection: 1) regulatory protection under a CAMP approach and 2) custodial site protection under a parks and protected areas approach (see next subsection on protected areas).

A useful supplement to the regulations for protection of generic habitat types is a "setback" provision whereby coastal development is prohibited in a "buffer zone" between the edge of the habitat and any structure or major land clearing or conversion. Setbacks have many uses in a CAMP program. For example, along eroding and receding beaches, a predicted "recession line" of say 50 years into the future, can be estimated by beach geologists and no structures allowed seaward of the line; thus, the recession line becomes, in effect, a setback line that anticipates sea level rise (about 30 - 40 cm per 100 years) and local erosional conditions. In another example, the CAMP authority might require a 50-meter buffer zone around the outer edge of a coastal wetland to prevent encroachment. Other examples of setbacks to prevent blocking the coastal viewscape or preventing pollution could be cited (Figure 5.5).

The process explained above has analogs in some CAMP planning and management programs, although the terminology may differ. For example, Puerto Rico (U.S.A.) has the following (57):

1) Generic Habitat Types: all mangrove forests are included in a "Special Planning Areas" category.

2) Environmentally Sensitive Areas: numerous bays, lagoons and other coastal features are included in a list of site specific "Special Planning Areas".

3) Parks and Protected Areas: numerous coastal areas of exceptional natural value are identified as potential "Natural Reserves".

An important motivation for designating critical areas is to preserve the habitats of species that have been designated as

Hawaii --40 ft.

Philippines ----- 20 m.
(mangrove greenbelt)

New Zealand ------- 66 ft.

Oregon ---------- Permanent vegetation line (variable)

Indonesia* ---------- 50 m.

Costa Rica ---------- 50 m.
(public zone)

Norway ---------- 100 m.
(no building)

Sweden ---------- 100 m.
(no building)

Costa Rica 50 m. ---------- 200 m.
(restricted zone)

Italy ---------- 300 m.
(no construction)

Indonesia* ---------- 400 m.
(mangrove greenbelt)

Greece ---------- 500 m.

Denmark ---------- 1-3 km.
(no summer homes)

USSR ---------- 3 km.
(exclusion of new
factories)

* Indonesia has both a 50 m setback for forest cutting and a 400 m "greenbelt" for fishery support purposes, a conflicting redundancy.

Figure 5.5. Coastal setback provisions in various countries; measures are the distance inland from the "shoreline", usually defined as the mean high water line. (Source: ref. no. 43)

especially valuable or in danger of extinction, such as, certain endangered birds, turtles, and marine mammals. These designations may be done in response to an international treaty or by independent national action. In addition to habitat management, there may be other appropriate actions to be taken under the CAMP program; for example, banning any exploitation of the species.

5.7 Protected Areas

The most certain way to protect designated environmental sensitive sites (ESA's) is to acquire ownership or assert ownership, if the areas are already owned by government. In most countries, proprietary rights (whether government or private) are accorded the highest level of exclusive determination for use of land or water areas. Most simply, if the government owns a resource, on behalf of the people, government can dictate the use of that resource. Therefore, government can set aside for resource protection -- as parks, reserves, refuges,or sanctuaries -- whatever areas it owns. Government ownership and designation for protection offers the highest assurance that a particular area's resource values will remain intact and is universally the way by which parks and other protected areas are formed and made secure.

Marine and coastal parks or other types of protected areas that are designated to protect ESA's, are most secure if they are integrated into a CAMP program. Planning for a park in isolation from surrounding land uses and peoples, and without interagency cooperation usually will not work because protected areas that are alienated from a wider program of coastal resources management exist as islands of protection threatened by surrounding areas of uncontrolled exploitation. CAMP can be organized to prevent pollution from these sources along with overfishing, destruction of "nursery" habitats, and other types of external impact that can be damaging to the protected area. CAMP provides an appropriate framework for integration of protected areas into a larger system of protection and a method of consensus building for their support.

The most comprehensive source of information on coastal protected areas is the book " Marine and Coastal Protected Areas: A Guide to Planners and Managers" (69) which should be referred to by CAMP organizers. The authors of this book (R.V. Salm and J.R. Clark), recognizing that coastal and marine protected areas must be considered in the broader context of a general program for coastal and marine resources recommend an "umbrella program" for conservation of renewable resources. This umbrella program would encompass the following:

- Limiting, as necessary, particular exploitative uses of coastal and marine waters and their resources or of

linked areas that influence life in these waters (for example, preventing the mining of living coral reefs to maintain their value to fisheries and to protect the coast from natural hazards);

- Protecting particular vital parts of coastal or ocean ecosystems (for example, critical habitats);

- Restoring earlier conditions (for example, closing areas to enable the recuperation of damaged habitats or depleted stocks, or prohibiting activities that are physically damaging or polluting);

- Obtaining and transferring information (for example, through research, education, and interpretive programs).

Creating coastal and marine protected areas (under government custody/ proprietorship) can help achieve development goals and enhance the benefits of current use. These areas are designed to promote sustainable utilization, whereby resources may be used, but not used up. Properly designed protected areas provide for a variety of uses and use controls in an integrated resource management scheme (69).

Habitats identified as ESA's may provide sanctuary to: 1) valuable species during vulnerable phases of their lives (shrimp, seabirds, fishes), 2) endangered species (whales and turtles), and 3) migratory species (waterfowl and wading birds). These habitats are used for feeding and spawning, as nurseries, and for shelter. Safeguarding these critical marine habitats by designating them protected areas can help conserve species, maintain fisheries, and support tourism.

Of the greatest economic importance is maintaining the productivity of fisheries. Continued fish production means continued livelihood for fishermen and for others in the fishing industry, including boat builders, trap and net makers, packers, distributors, and retailers -- all of which enhances social, cultural, economic, and political stability. Of particular importance, a strong domestic fishery promotes self-sufficiency and reduces the outgo of foreign exchange.

Protected areas planning is central to the full development of a country's CAMP program. While a system of protected areas can be organized independently, it will be more effective if it is part of a CAMP program or closely coordinated with CAMP. The parallelism with CAMP can be seen in the following recommended stages in the development of a national coastal/marine protected areas system (69):

1. Policy and legislation formalize the governmental decision to initiate and advance the program and to set goals and objectives for its implementation.

2. Preliminary planning interprets policy and legislation, organizes the planning agenda, identifies the planning team, and defines program objectives (though there may also be preliminary planning toward policy and legislation).

3. System planning [strategic planning] looks broadly at program goals and objectives, provide selection criteria, and identifies and selects sites.

4. Site planning provides the initial site design, including use zoning, and the management plan for each protected area in the system as well as for future revisions as.

5. Implementation and management develop, administer, manage, and improve the protected area site.

5.8 Protection Against Natural Hazards

In many of the more densely populated nations, the risks of natural disasters to inhabitants of the coastal lowlands are being increased by population increases and development projects. Coastal people become more susceptible to natural hazards such as floods, typhoons, or tsunamis when land reclamation projects encourage settlement in dangerously low-lying areas, or when land-clearing and construction removes protective vegetation, reefs, or sand dunes (75). A particularly disastrous example is Bangladesh where more than 100,000 people were lost in two major storm/flood events in the past 10 years.

Hazards loss reduction begins with preservation of coastal landforms that provide natural resistance to wave attack, flooding, and erosion from hurricanes and storms. These landforms differ significantly around the world. Human activities that remove or degrade protective landforms - for instance, by removing beach sand, weakening coral reefs, bulldozing dunes, or destroying mangrove swamps - diminish the degree of natural protection the coast affords. For example, if dunes are removed by sand mining or because of obstruction to ocean views, the risk to coastal development behind the former dunes is greatly increased. Similarly, mangroves, serve to dissipate wave energy and to stabilize the land areas behind them from the erosive forces of storms (26).

The value that these natural resources have for hazard prevention reinforces the need to identify them as <u>critical areas</u> and provide for them strong measures of protection (for example,

as was done in Western Australia (60). Some common elements of resource conservation and hazard mitigation include (24):

1. Both require integrated approaches and centralization of authority in order to control the location and type of development (see Box 5.6).

2. Both require preservation of the natural elements that protect coastal populations from cyclonic winds and storm surges, e.g. mangrove forests, sand dunes, beaches, and coral reefs.

3. Both require management of coastal watersheds and river basins; e.g. in order to protect municipal water supply and coastal water quality and to reduce coastal flooding damage.

4. Both require involvement of many levels of government from national to local, as well as international cooperation, in some instances.

In the CAMP context, the following two management guidelines are the most important:

- Conserve protective features: There is a need to protect to the maximum extent possible all the natural resources and features that protect the coast from storm surge and waves in high hazard areas (prohibit sand removal; avoid mangrove clearing; protect coral reefs, etc.)

- Establish a setback line: There is a need to delineate a "high hazard zone" for the coast and keep all coastal construction inland of it (i.e. create a coastal construction setback line).

The conservation of protective features for hazard protection would be handled by the CAMP program in the same manner as conservation of natural habitats, as explained in the preceding two subsections (5.6, Critical Habitats and 5.7, Protected Areas).

The "high-hazard zone" is the area of the coast that is periodically subject to the risk of flooding (still water rise) from storm surge and the risk of impacts from storm wave velocity (including erosion and property damage). The periodicity of storm and flood events can be calculated as the chance that a hazard event will strike in any one year. The result, often called the "recurrence rate or probability" is given as the percentage chance that an event will occur in a one-year period. Thus, a recurrence rate of 0.10 means that there is a ten percent chance

Box 5.6

Sand Mining, Erosion, and Coastal Management Problems in Grenada, St. Vincent, St. Lucia, St. Kitts, Dominica, and Antigua

The three main problems common to all the islands are the mining of beach sand and in some cases aggregate also, the need for proper coastal development policies including setbacks, sewage treatment etc., and finally the need to have one ministry or department with overall responsibility for the coastal zone.

The mining of sand and/or aggregate has been identified as a coastal problem in the islands of the East Caribbean previously. In all the islands there is legislation controlling sand mining, however, in many cases it is the Ministry of Public Works who has to implement this legislation and all too often it is that Ministry which is the greatest offender of the sand mining laws. In addition, there is always the problem of monitoring and implementation, in some cases this is carried out by the local village councils. Obviously beach sand mining should be stopped, but unless an alternative can be offered at a reasonable cost, this is not feasible. Nevertheless, viable alternatives for beach sand should be actively sought.

The other problem concerns coastal development. This has to be well planned incorporating knowledge of possible coastal changes. A coastline is not a static feature. In some islands there is no coastal setback policy, in other islands the setback is not sufficient for the extent of coastal changes. In view of natural erosion trends, in addition to man caused erosion, setback policies must be implemented in order to conserve the coastal zone and to conserve the developments. A setback policy of 100 m on lowland coasts is recommended. Other aspects of development, specially waste disposal, have to be carefully monitored and controlled, changes in the beach zone are closely linked to changes in the offshore zone.

Finally, and perhaps most importantly, one Ministry or Department should have overall responsibility for the coastal zone. The actual Ministry varies from island to island, but unless one body has responsibility for the coastal zone, it is impossible to successfully implement a coastal policy. In most islands it is easy to distinguish which particular Ministry should have this responsibility.

Source: G. Cambers, 1985 (reference no. 14)

that a damaging storm will occur in any one year at a particular site.

Having the above information, the CAMP authority can then place the coastal setback at a particular risk point; for example, far enough back from the high water line so that all structures behind it have only a 0.04 or 4 percent, probability of being hit by a flood or storm waves. The 4 percent probability level is sometimes called a 25-year event because four chances in a hundred equals one chance in twenty-five. In placing the setback line, the CAMP authority could pick the 20, 50 or 100-year event (0.05, 0.02. or 0.01 probability) as the controlling risk factor, and relate it to the corresponding distance inward from the high water line. The degree of precision required in delineating and mapping the line depends upon the circumstances of the particular program. Note that the subject setback line is only for storm hazards and if there are also to be boundaries and buffer areas for generic habitat types or ESA's, the two types should be combined into a single setback line if possible.

The solution of the State of Western Australia is to provide a setback in order to retain, in public ownership, a buffer strip of land above, and along, the mean-high-water line (60). The purpose of this buffer strip is to prevent private development from encroaching into the hazardous coastal "edge zone"(see Principle 4). The buffer areas of public land are held in "reserves", a type of protected area (see previous subsection) with a major purpose of keeping development back from erodable and floodable shore areas and to protect edge zone natural resource values.

The most troublesome erosion of beaches occurs in developed areas where buildings and roadways have been placed too close to the water's edge and are being undermined or threatened by storm induced erosion. In such cases, the beach is often "armored", that is, seawalls or groins are built to protect the threatened properties or jetties are built to keep inlets open. But these structures are very expensive and may even worsen the situation (see Subsection 2.6). Therefore, they should be closely reviewed by the CAMP authority to see if less expensive and more successful "soft-engineering" alternatives exist (see Principle 9). An example is given in Box 5.7.

5.9 Pollution Control

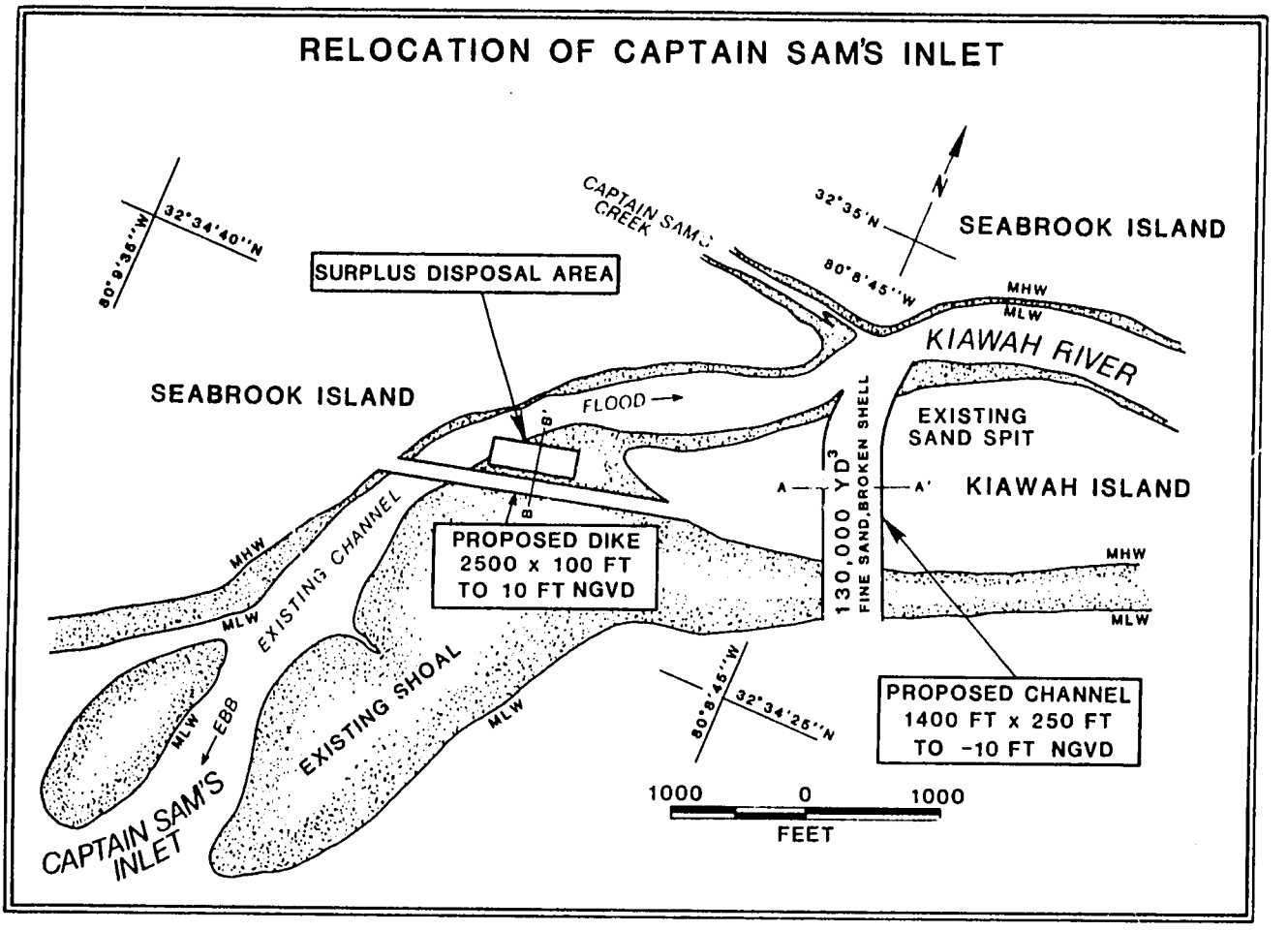
Coastal waters are particularly susceptible to pollution where they receive the outflow of streams and rivers in lagoons or estuaries. Obviously, pollution is at its worse in the harbors of large coastal cities and industrial ports. Whether the pollution is from oxygen-depleting organic waste (e.g. sewage) or from toxic industrial wastes, it is damaging to coastal

Box 5.7

The Solution of a Beach Erosion Problem by the "Soft-Engineering" Approach

Harbor inlet stabilization represents a good example of "soft-engineering", represented here by Captain Sam's inlet (South Carolina, U.S.A.) whereby inlet relocation was used instead of the typical double jetty construction. Based on historical analysis and continued threat to erosion to a downdrift, developed shoreline, plans were devised to artificially relocate the inlet (see the figure below).

Total cost of the project, including engineering and monitoring, was US $250,000. The relocation of Captain Sam's inlet freed upwards of one million yd^3 of sand presently trapped on the existing ebb-tidal delta to migrate (under wave influence) to eroding downdrift beaches. Life of the project is estimated at 10 - 15 years (before a similar relocation is necessary). The project was completed in February 1983, and performance is up to expectations.



Source: T. Kana, ref. no. 46

environments and resources as well as a risk to human health (Figure 5.6).

In most countries, a pollution control authority has been established and is operating, that it will retain continuing responsibility for pollution, and that CAMP should coordinate with that authority regarding conformance of development projects with national pollution standards. In this role, projects with unacceptable potentials for pollution would be discouraged or modified to acceptability and conformance with standards. CAMP programs should focus on special coastal pollution sources, such as those caused by new development and, especially, those that affect ESA's.

One source of pollution that might come under the primary responsibility of CAMP is storm runoff from shorelands. Sediment runoff from construction sites, farmland, and forest cutting and land clearing operations can be seriously damaging to the productivity of coastal areas and can result in filling of embayments. Also, pollutants flushed by storm runoff into coastal waters can create toxicity (biocides, oil wastes, etc.) and bring excessive nutrients (fertilizers, animal wastes). These are matters that can be addressed in development review in the CAMP management program (Tier 3 and Tier 4; see subsection 5.3).

Another pollution source of particular relevance to CAMP is oil pollution that originates during exploration, production and transportation phases of the oil industry. Chua and Charles [51] emphasize that: "In recent years, oil pollution of the marine environment has been an issue of considerable national and international concern". The deleterious effects on the marine environment and the living resources as a result of growing frequency of oil spills have caused public awareness and widespread political attention. It is interesting to note that of the total budget of petroleum hydrocarbons introduced into the oceans, 34.9% arise from marine transportation, 26.2% from river runoff, 9.8% each from natural seeps and atmosphere rain, 4.9% each from urban [illegible] industrial and municipal waste, while oil refineries and [illegible] account for only 3.3% and 1.3% respectively. The [illegible] contribution from offshore oil production in terms of blowou[illegible] wells or leakage from producing site is said to be relat[illegible] significant (16).

It should be [illegible] m the above that 66 percent of oil entering the sea is [illegible] rine transportation or local runoff, two sources of partic[illegible] elevance to CAMP programs. Table 5.1 shows the vulnerability [illegible] different coastal habitat types to oil. It can be presumed that this relative ranking (for Eastern Peninsular Malaysia) would apply to many countries with the same habitat types and could be used for guidance in CAMP programs until specific data are collected for the country. But slick

POLLUTANT	SOURCE	EFFECT ON COASTAL WATERS
Petroleum Hydrocarbons	Fuel exhausts Motor oil and grease Power plant emissions Industrial discharges Spills and dumping Leaking underground storage containers Urban runoff	Spills can kill aquatic life, damage beaches, and permanently destroy wetlands. Runoff can be toxic to marine organisms – causing death, disease and reproductive problems.
Chlorine	Water treatment plants Swimming pool backwash	Kills aquatic life.
Nutrients	Agricultural, forestry, and urban runoff Industrial and boat discharges Sewage treatment and package plants Septic tanks Animal feedlots	Enrichment of rivers and sounds (eutrophication) resulting in algae blooms. Blooms can alter the food chain then decay, depleting oxygen and causing fish kills. Eutrophication is also suspected of causing some fish disease problems.
Fresh Water	Water running off impervious surfaces Land clearing Draining wetlands Channelization of streams	Changes salinity patterns in estuarine habitats, causing slowed growth or death of juvenile organisms, or poor reproduction.
Bacteria and Viruses	Septic tanks that are spaced too densely, placed on porous soils, located in high water tables, or that leak Sewage treatment or package plants Boat discharges Animal feedlots Urban runoff	Contaminates shellfish waters, so consumption of shellfish may cause disease. Contaminate groundwater, so using for drinking or bathing may cause disease. Contaminates surface waters, so swimming may cause disease or wound infections.
Sediment	Land clearing Dredging Erosion	Clogs marine waters. Covers marine habitats, smothering some organisms. Causes turbidity in water, shading out producer organisms and altering the food chain.
Temperature	Factories Electric generating plants Urban runoff	Alters reproduction of fish. Reduces dissolved oxygen which may then cause fish kills. Contaminates fresh water supplies used for drinking, irrigation, and the like.
Heavy Metals	Fuel and exhaust of motorboats and automobiles Industrial emissions and effluent Sewage treatment plant effluent Landfill wastes/leachate Urban runoff Naturally in soil Hazardous waste spills and disposal	Accumulate in fish tissues and are passed on to humans. Contaminate drinking water, causing brain damage, birth defects, miscarriages, and infant deaths.
Synthetic Organic Chemicals	Forestry, urban, and agricultural runoff Industrial and municipal effluent Spills or dumping	Cause cancer, birth defects, and chronic illness when consumed in contaminated water supplies or seafood.

Figure 5.6. Typical coastal water pollutants and their effects. (Source: ref. no. 55)

trajectories for spills at sea have to be calculated for each country and each section of coast separately.

5.10 Restoration

It is axiomatic that the most developed coastlines have the most degraded renewable resource systems. Pollution, habitat conversion, and interference with water circulation, among other effects, have seriously reduced the economic and environmental benefits of most natural systems. While it is an important function of CAMP to constrain further ecological losses, it is also important to plan for the repair of natural systems damaged in the past.

If a wetland is covered with fill behind a concrete bulkhead, it is unrealistic to plan to restore it to its original condition; but if a wetland has been diked for rice culture or aquaculture, it would be relatively easy to reconvert it to a nearly natural wetlands condition.

If a coral reef has been damaged by pollution, hurricanes, mining, or boat anchoring, it may be difficult, but not impossible to rehabilitate it. The rehabilitation can be costly and the time of recovery very long, but for certain reefs of high value for tourism, fish breeding, or shore protection the investment could yield a high payoff (22).

Degraded dunes and beaches can be rebuilt. Mangrove forests can be replanted. Polluted estuaries can be cleaned up. The technology is well developed for most such restoration projects, following the "nature synchronous" approach (see Principle 9). It is usually only a matter of locating a source of funding, which may be difficult sometimes.

In summary, the CAMP program should include an ecosystem rehabilitation planning element. This will require an investigation of the condition of coastal resources, an economic evaluation of losses and benefits of rehabilitation, and recommended priorities for rehabilitation projects.

5.11 Fisheries

As previously mentioned, CAMP-type programs are not usually involved with control of fishermen or fisheries harvests, but rather with fish and shellfish habitats and water suitability. Because the typical fisheries management role is not likely to be subsumed by CAMP, the coastal management program is often an independent venture with cooperation from the fisheries authority. There will be a much closer connection between CAMP-type programs and the small-scale, artisanal, fisheries than with the more industrialized offshore fisheries, because the

artisanal fisheries are conducted in near-coastal and lagoonal/estuarine waters where CAMP is most relevant. A primary interest of coastal fishermen in CAMP is its potential role in the conservation of critical habitats and protection of water quality.

In aquaculture, the role of CAMP is more direct because aquaculture usually requires the conversion of land and water areas, a habitat issue. Growout pond construction, for example, usually requires conversion of natural coastal lowlands or mangrove forests to open water impoundments. If aquaculture expansion is not controlled, the long term consequences of habitat conversion may be to reduce the natural reproduction of species used in aquaculture, as well as reduce other natural values and contribute to pollution of shallow coastal waters. The presently favored management response to requests for additional construction of ponds is to recommend against expansion <u>if</u> intensification of use and increased production from existing ponds is feasible (74).

A recommended set of guidelines for mangrove coasts of southeast Asia is shown in Figure 5.7.

With assistance from USAID, Ecuador is developing a CAMP-type program called a "Coastal Resources Management Program" (CRMP) which has as a main element, and major motivation, the control of coastal shrimp aquaculture. The enormous Ecuadoran aquaculture industry has preempted much of the mangrove forest along the coast and the natural production of young shrimp needed to stock the growout ponds has been reduced. CRMP is proposed as the management and planning approach best suited to control the expansion of the industry and, at the same time, to accomplish other needed management functions (see Box 5.8).

5.12 Traditional Conservation Practices

The effectiveness of "traditional" conservation, such as fisheries management, at the local level (village, tribe, etc.), has been recognized recently in studies in Nova Scotia (Canada), Brazil, Palau, The Solomon Islands, and elsewhere (see Principle 14). But there is little experience with incorporating traditional conservation into broad CAMP programs. However, there has been enough thought given the subject to consider how it could fit under the umbrella of CAMP.

Presently, the best approach appears to be the establishment of designated marine protected areas with joint authority between the local village or tribal governing unit and the national government. With the traditional conservation area set aside as a protected area, rules of access and resource use can be formulated to give priority to the traditional users. In this situation, where the traditional group has exclusive, or

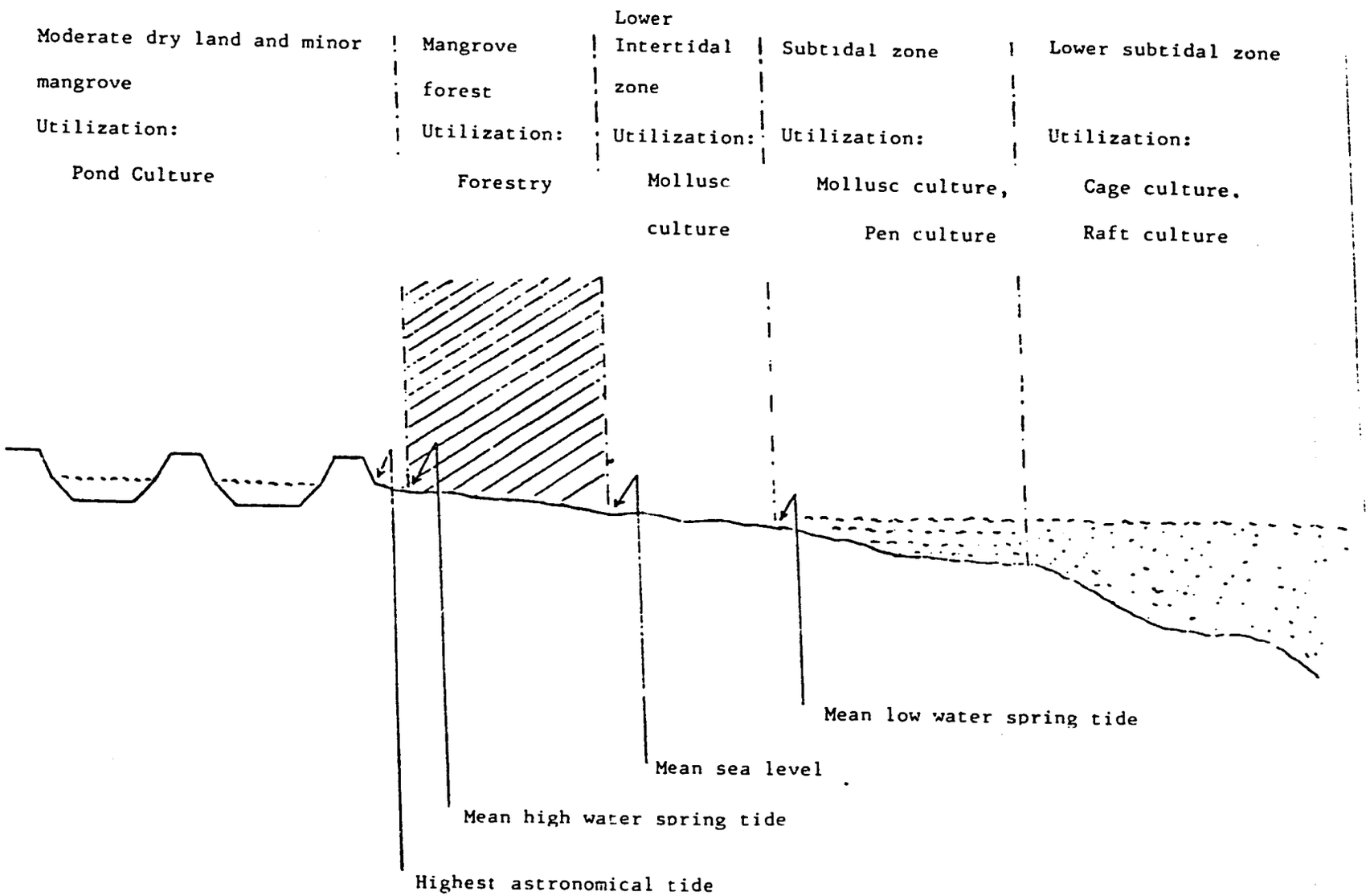


Figure 5.7. Recommended land-use guidelines for mangrove areas. (Source: ref. no. 31)

Box 5.8

Ecuador's Proposed Coastal Management Program

Ecuador's Coastal Resources Management Program (CRMP) began in March, 1986, when USAID selected Ecuador as the first of three countries in which to start a pilot project on integrated management of coastal resources. The Coastal Resources Center of the University of Rhode Island (URI) and the Office of the Environment in the Ministry of Energy and Mines (DIGEMA) in Ecuador were chosen to implement the project.

Ecuador's future economic development in large measure depends upon how its coastal ecosystems are utilized and managed. It is of the utmost importance that the resource base of agricultural products, lumber, fisheries and cultured seafood is not needlessly degraded.

The seven proposed components of the program (as of August, 1988) are as follows:

1. Form a Ranger Corps to improve enforcement of existing statutes;
2. Designate special management zones and create a decision making body for each;
3. Create advisory committees in each management zone comprised of citizens and local and regional government entities;
4. Establish in Quito a simple structure to provide high level governmental support to the CRMP program;
5. Establish a public education program to show the people the importance of coastal resource management;
6. Establish a research program on coastal issues, and;
7. Develop a training program for all levels of participation in coastal resources management.

Source: Coastal Resources Center, U. of Rhode Island (adapted from ref. no. 49)

priority, access to the resource, more care may be exercised in the quantity of fish or shellfish removed, abstinence may be practiced during spawning periods, and less destructive fishing methods may be used. In some cases, this will provide for better conservation of fishery resources than nationwide, centrally operated, management. But, a combination of the two approaches might give an even better result.

In one example, protection has been advocated for the Marovo Lagoon in the Western Province of The Solomon Islands in order to preserve "customary fishing rights" (4). The recommended management authority is the "Area Council". Continuance of the local culture (population 5,500), which is oriented toward the sea and sea fisheries, depends on maintaining fish stocks. This requires not only control over the fish harvest, but protection of habitats against adverse impacts of forest clearing and logging, mining, coastal agriculture, and exploitation by cruising yacht tourists. A protection program can be most effectively advanced in this type of situation by acquiring (if necessary) the appropriate amount of shorelands, transition area, and open water as a protected area, such as a "resource reserve", and delegating its management to the Area Council ("custodial" approach).

A second approach is to designate the same area as a Regional CAMP Unit and protect its resources through regulations and guidelines (the "regulatory" approach). However, the custodial approach (above) should work better because the management authority actually owns the area and proprietorship generally confers a higher level of autonomy than regulation through the "police power" of government. The central government keeps some control by "leasing" the area to local authorities; the lease would be revocable for cause. The optimum arrangement would be to fit the custodial, protected areas, approach into a general CAMP regional program.

A Commonwealth Science Council report (76) recommends the following guidelines for the assessment of traditional fisheries:

- adaptability of traditional systems in the face of changes in perception, technology and society;
- the place of traditional knowledge in society - its role in social status, and differing sex roles;
- responses to commercial development;
- adaptability of traditional fisheries management regimes;

- effective means of obtaining and recording traditional knowledge;
- definition of traditional fisheries;
- clarification of nature of coastal resource use rights;
- social unit(s) on which rights are based;
- principles of boundary delimitation;
- allocation and transfer of coastal resource use rights;
- procedures for sharing of resources with outsiders;
- traditional conservation practices;
- dispute resolution mechanisms.

It should be noted that the major result of officially recognizing traditional (or "customary") conservation in a CAMP-type program will be to change public property rights in the commons to village or tribal property rights. This can be accomplished by a variety of techniques, including designating the fishing area as a "resource reserve".

5.13 The Incremental Approach

While the CAMP program is to be planned and organized in a comprehensive nationwide format, it can be implemented either region by region, resource by resource, or function by function.

The regional level of implementation allows immediate action on the most severe coastal problems, enables a nation to obtain experience with CAMP region by region, provides time to develop and recruit expertise, and presents later opportunity to make needed mid-course corrections (75). Major port and lagoon (or estuary) complexes are the focus of the greatest intensity and number of coastal resource conflicts, and the greatest environmental degradation. As a result, national interest in CAMP may focus on one or several of these complexes. One region of concern may be an urban center surrounding a major port and its associated bay, lagoon, or estuary. Other examples in this region may include regions of lowland agriculture, coastal rural settlements, tourist regions of beaches or natural spectacles like flamingo or ibis migrations. (For details see subsection 5.14).

Another incremental approach is to define specific resources or problem areas to initiate the CAMP management process. It may be expeditious to focus first on problems of limited geographic scope, such as shoreline erosion, loss of coral reefs, or degradation of estuarine fish spawning areas,

using the strategies of critical area designation or shoreline exclusion setbacks (75). "Critical area" designations and "exclusion zones" are relatively inexpensive and simple to administer. Either strategy can be implemented on a site specific basis, commensurate with available information, staffing, or expertise. They can be reinforced with regional planning or broad sectoral planning of larger geographic scope: combining wetside estuarine or marine area protection with dryside (shorelands) management strategies offers the possibility of managing whole coastal ecosystems.

A third type of incremental approach is at the administrative level, whereby all the CAMP functions are not implemented at one time, but rather are implemented function by function. For example, the program may start with project review (environmental assessment) only and without planning or technical services which will follow at later phases of implementation.The incremental approach to CAMP implementation provides the opportunity to test concepts and approaches as a pilot effort before committing energies and political capital to full-scale nationwide effort. The risks and consequences of failure are considerably less when a program is implemented incrementally. Also, the experience gained during the incremental effort will increase the likelihood of success of the later expanded effort. In summary, CAMP planning should address the full range of national issues, but the actual management program can be implemented incrementally by region, by resource, or by function.

5.14 Regional Incremental Approach

CAMP-type programs can benefit from the regional planning approach in at least two different ways: 1) the national CAMP program can be organized to implement individual Regional Unit programs, if it has the flexibility to recognize regional distinction, and 2) the national CAMP program can be organized to facilitate input into presently ongoing regional economic development planning activities. If either the first option (specific regional CAMP program) or the second (facilitated input into regional development planning) are chosen, it is appropriate for coastal interests to understand what regional planning is and how it operates. [Note: one of the best reference documents on regional planning is "Integrated Regional Development Planning" (59) produced by the Organization of American States (OAS) in 1984, in cooperation with the U.S. Agency for International Development (USAID) and the National Park Service of the United States Department of the Interior].

In the regional approach, specific "Regional Units" would be selected for customized planning and management programs to created specifically for the conservation, economic, and social needs of particular coastal regions. A Regional Unit might be a

particular bay, estuary/lagoon, or commercial port and its surrounding communities and land resources (e.g. see Figure 5.8). Or it might be a stretch of coast including beaches, coral reef and lagoon, and surrounding villages and resorts. Or perhaps, an island and its aquatic surroundings.

It would be quite feasible to organize a CAMP program to provide both nationwide protocols and standards and regional unit special requirements, the former dominated by national interests and the latter by local interests. In fact, the U.S. CAMP program, operated by individual states, allows both statewide and special regional unit programs (called Special Area Management Programs) and, in addition, state programs must be in conformance with national standards for coastal conservation.

In a trial program of great value, the Association of South East Asia Nations (ASEAN) is operating a coordinated series of regional-unit CAMP pilot studies, one in each of the six ASEAN countries. The idea is to start with prototype regional units in hopes that these will show enough promise to encourage the individual countries to implement nationwide CAMP programs or, at least, to attempt more regional unit programs within each country. The project is funded by USAID, operated by the International Center for Aquatic Living Resources Management (ICLARM) in Manila and will run until 1990.

For professional planners, understanding the benefits and mechanisms of CAMP-type programs should be easy. While on one hand, CAMP programs are distinctive because the coast is such a different landform with such different resources and unique problems, on the other hand, the CAMP process of program development is a familiar one. Regional economic development planners and resource planners, particularly should feel comfortable with CAMP because it deals with designated areas, the variety of resources and economic sectors therein, and other compatible subjects.

5.15 Future Planning and Information Services

To think that planning ends with Program Development would be incorrect. In an effective CAMP program, planning is a continuing process, perhaps even more at the tactical than at the strategic level; therefore, we have included a planning function in this chapter on program development and implementation. Because conditions change and the CAMP program is always gaining experience and evolving, planning must be an ongoing activity. The planning function should include the more technical aspects of the program and the more scientifically trained staff.

In the CAMP program development structure suggested herein, where management functions are separated from planning functions

(somewhat arbitrarily), a permanent planning unit can be annexed to the CAMP staff or planning services can be obtained from Universities, research institutes (as in Trinidad and Tobago),or consultants. The planning unit would handle a wide variety of services in the areas of data collection, planning, education, special programs, advisory technical services, and research. In a modest size program for a small country the CAMP planning unit might consist entirely of one or two professionals with additional outside assistance as needed.

Assistance to Management: The planning unit's initial priority should go to supporting the management unit in its work. This would mostly entail furnishing technical background material, including surveys and delineations of special areas. Much of the output would be maps and overlays.

Locating and mapping the management boundary of the coastal areas, or coastal zone, would be one of the first jobs (we assume that planning boundary was delineated during the strategy plan phase). This would be fairly simple if an existing mapped boundary were used; e.g. the "25-year flood line", a coastal highway, or a topographic line such as five meters elevation. Where a new boundary line has to be delineated with multiple specification, the task could be complex, particularly where a high degree of precision is required because of expected controversy of the kind that occurs whenever land-use zoning of any kind is done.

The planning unit would usually have little or no role in specific development reviews or environmental assessments with the exception of those that involve technical analysis or original field study.

Surveys: The planning unit would be responsible for identifying, evaluating, and delineating generic critical habitats such as mangroves, coral reefs, dune fields, seagrass meadows, and species habitats, and buffer areas around them where appropriate. Hazardous areas such as coastal flood plains and high-hazard zones could also be described and delineated. Polluted areas would be located and mapped.

Another important survey job is identifying, evaluating, and delineating: 1) specific "environmentally sensitive areas" to be "red-flagged" for regulatory protection, through the development project review process, and 2) areas to be recommended for parks, reserves, sanctuaries, refuges, or other protected areas status.

Additional survey work to be done includes advance identification of areas that are not ecologically critical habitats by if developed could cause specially negative impacts on coastal ecosystems, such as steep slopes with high sediment runoff potential.

Environmentally Sensitive Areas: The survey, mapping, and evaluation of resources can be a very important addition to a CAMP program. It can identify in advance the most valuable, or critical, coastal habitats, ecological functions, tourist attractions, and places most subject to natural hazards damage. This information would be useful in the review and assessment of coastal development projects and in identifying candidate sites for coastal parks and protected areas. A survey would also locate highly polluted waters and degraded resources that need rehabilitation. Another benefit would be the location of optimal sites for future development activities.

Upland Effects: It would probably be the job of the planning unit to create strategies for reducing negative impacts from upland activities. In the natural state, uplands terrain and hydrologic systems -- streams, ponds, wetlands -- can hold and can detain large amounts of storms water, acting in effect as a natural sponge that holds water during heavy rains or snows for later, more gradual release. This provides an ecologically compatible rate of runoff flow as well as some protection against flooding for downstream communities. Uplands are also important in protecting coastal waters from storm runoff pollution because their vegetation and soils cleanse the water (26).

The beneficial functions of the coastal uplands are diminished when the terrain is cleared of vegetation, paved, or altered to accelerate drainage; when surface water bodies and watercourses are filled, detoured, or channelized; or when the natural flow pattern is significantly disrupted so that freshwater flow to the coast occurs in surges.

In a practical sense it will be most difficult for CAMP to obtain much influence over upland development activities because it is uncommon for those who plan dams or land clearing enterprise to consult with coastal interests. However, it is worth trying to get in a position to review and comment on major upland projects (see Box 5.9).

Multiple Use Compatibility: In the coastal area, as elsewhere, some resources are more vulnerable to development impacts than others and some development types and uses are more threatening to resources than others. Information on these two aspects is useful to CAMP programs, particularly categorizations which can be used in development project review and in multiple-use economic development planning. The simplest way to do this is by a trichotomous approach in which:

- land and water areas are classified as -- 1) approvable for development, 2) not approvable for development, or 3) approvable for development under specified conditions

Box 5.9

Downstream Effects of Large Dams

Rivers the size of the Usumacinta River in Tabasco, Mexico, control natural and human life for hundreds of miles downstream and most importantly where they spread into the wide plains of their coastal deltas (the Usumacinta flows north across the Yucatan to enter the Gulf of Mexico at the Bay of Campeche). Here, at the coast, the big rivers build, serve and rule the lowlands through hydrologic, geologic, and biologic forces well known to science.

These forces deposit silt to build and maintain the natural levees which channel the rivers and provide the high ground for human settlement. They provide water flows in a regular seasonal pattern, or "hydroperiod", to which all the trees, wetlands, fish, birds, wildlife, and human endeavors are keyed. The mighty Usumacinta River ministers to 4 1/2 million acres of delta wetlands and lowlands.

When the natural hydroperiod is altered by upstream dams that divert water flow or hold it to be released on an artificial timetable, the consequences may be severe, particularly to the downstream people of the Mexican states of Tabasco and Campeche, whose lives and fortunes are tied to the Great Delta Wetlands.

This natural complex is a major resource system on the Gulf of Mexico rim, containing Mexico's largest mangrove forest, its richest shrimp fishing grounds (the Bay of Campeche), and its premiere waterbird habitat. The wetlands also provide the major life support of the contemporary Mayan agrarian community of the Delta, including natural forage for their large herds of cattle.

The State of Tabasco is moving to conserve its part of the Great Delta Wetlands. In 1987, Governor Enrique Gonzalez Pedrero completed an intensive study aimed at creating a conservation plan for 700,000 acres as the "Centla Biosphere Reserve". Under the Centla Plan, nature and human life will coexist under and enlightened scheme of resource management, the hallmark of the UNESCO-created biosphere reserve model.

Source: Author

- development project types are classified as -- 1) acceptable, 2) unacceptable as designed and located, or 3) acceptable with changes in design and location.

This is a sort of triage approach whereby the safe and unsafe can be dealt with expeditiously and maximum effort can be applied to the in-between categories of either areas or development types. This type of simple classification would be an initial job for the planning unit; later, more sophisticated types of classifications might be generated (e.g. land suitability analysis).

Another facet of the same issue is multiple use potential. Decision makers need to know what economic and social uses can coexist in an area and which cannot. In most situations the multiple use approach should be advocated. In some situation, however, exclusive use should be recommended. The CAMP planning unit should be prepared to investigate compatibility and make recommendations for multiple, or exclusive use.

Burbridge (1986) makes a compelling argument for multiple use strategies for coastal resource in demonstrating that a unique feature of the ecological systems of the coastal zone is the wide variety of functions they serve and the broad array of economic and environmental goods and services they provide (9). In the case of mangroves, over 70 direct and indirect uses arise from mangrove forests. In addition, the mangrove forest acts as a nursery, feeding or spawning area for commercially valuable fish and shrimp species. These and other services cannot be replaced at a reasonable cost.

The following have been listed by Sorenson et al. (75) as major types of coastal economic sectors identified by various countries, all of which may be addressed by integrated CAMP programs:

- fisheries,
- water supply,
- recreation development,
- tourism development,
- port development,
- energy development,
- industrial siting,
- nature protection

- agricultural development,

- aquaculture development.

Many of these uses could co-exist in a multiple use approach while others might not, or would have to be severely restricted. CAMP's role is to sort them out and recommend the optimal mix. For example, there is little problem in combining fisheries, tourism and water supply, but mixing port development and tourism with critical area protection (e.g. mangrove forests) may be very difficult. The planning unit's job is to evaluate the effects of uses in combination in order to advise the decision-makers and managers.

Restoration/Rehabilitation of Resources: While all coastal resources that have been lost cannot, in a practical sense, be returned to productivity, some of them can. Mangrove forests can be replanted, dikes dismantled, normal fresh water or tidal flows to wetlands restored, and coral reefs can be started toward gradual renewal. The CAMP planning unit should identify, through survey, the critical areas that have been degraded and can be repaired at reasonable cost and effort. These can be mapped, priorities assigned, and a strategy for rehabilitation created.

Training, Education and Advisory Services: A full scale CAMP program will include many important education and training responsibilities which would be best handled by a planning unit. Staff training is essential in a field like CAMP where so many different types of activities and technologies are involved. Training would range from short courses and on-the-job training to formal university degree courses. International assistance is available to most developing countries to meet a variety of training needs.

In one example, the Coastal Area Planning and Management Division of Trinidad and Tobago (located in the Institute of Marine Affairs) listed its priorities for staff training in CAMP as: (52)

1) assessment of sociological impacts

2) assessment of economic impacts

3) cost benefit analysis

4) simulation analysis

5) resource management

Another type of training activity that is particularly important for CAMP programs is orientation courses for decision

makers and agency staff in the various ministries or departments that are affected by CAMP. Seminars, clinics, field trips, and other dialogues will help these agencies to understand the CAMP program and assure their cooperation.

Another role for a planning unit is in public information and education. Informing the public as to the purposes and approaches of CAMP and the long term benefits to be gained from conservation is important. Holding local consultations and hearings is essential to the success of new initiatives that affect coastal communities.

With a CAMP management unit reviewing development proposals and often requesting changes in project specifications, developers will soon find that they can benefit from prior consultation with CAMP staff. Also, a need for technical descriptions and guidelines will emerge. Consequently, the planning unit will find another role in providing a variety of technical consulting services to developers and other coastal interests.

Environmental Assessment: A major job of the information function of CAMP is to conduct environmental impact assessments for particular projects under review (see Subsection 5.5). According to Maragos, et al, (48), the environmental assessment process is the mechanism by which the ecological and other environmental consequences of proposed development are estimated and recommendations provided to decision makers to reduce or avoid impacts. For coastal development, the major steps of the assessment process include (48):

- Data gathering on project alternatives and coastal resources to be affected, including existing uses of these resources;
- Estimates of the adverse environmental impacts likely to follow development;
- Identification of measures to reduce unavoidable impacts;
- Identification of designs, locations, and precautions to prevent avoidable impacts; and
- Recommendations to decision makers on the best combination of measures and alternatives to minimize impacts.

Maragos et al (48) remind us that most development involves several phases; preliminary feasibility studies; selection of a plan and detailed engineering and design; construction; operation; and decommissioning of facilities, if applicable. Throughout the assessment and planning process, there will be an accumulation of physical, ecological and other environmental information. In time this information normally progresses from

general, qualitative, and extensive in character to detailed, specific and quantitative. Although qualitative information is invariably required for all types of development, the choice of alternatives to be implemented dictates to a great extent the need for quantitative information. Often the need for expensive quantitative data gathering can be avoided if the project proceeds in a direction that minimizes adverse impacts.

Regional Planning: Much of what the planning unit would do is a type of regional economic development planning, particularly in relation to Regional Unit Programs.

In general the nationwide CAMP program should pick up the essence of regional planning; i.e., over a broad area economic opportunities should be identified, evaluated, and prioritized. Development strategies should be evolved that integrate the interests of various economic sectors, that optimize the benefits of resource uses, and that assure that development initiatives are sustainable and socially equitable.

Specifically, in regard to CAMP Regional Units, the basis of these regional initiatives should be a coastal derivation of regional planning, but with a strong focus on resource conservation and sustainable use. Once a regional planning document has been created, it will serve as an effective guide to the CAMP manager in project review and assessment. Hanson (15) makes the point that: "What is needed, in general, is a sharper focus on the definition of sustainable development and how alternative approaches to projects will help to attain the objective. Despite the need for fairly short time spans for creating regional development strategies, the actual process of implementation is likely to be step-wise, over a very long time span. Hence, adaptive environmental management strategies emerge as the best means to achieve fine-tuned regional development concepts." (see Premise 15).

The regional development approach provides a means to at least partially overcome the limitations of uncoordinated project planning and implementation (59). Yet development will still be heavily dependent upon individual project analysis, and within this some form of extended cost-benefit analysis is likely to dominate. Inputs from environmental assessment may be incorporated into the cost-benefit analysis if appropriate. It is important to utilize the variety of ways in which environmental inputs may be incorporated into the planning cycle (see Premise 10).

Environmental impact and social impact are specially important considerations in planning regional development. A human ecology perspective takes into account traditional uses, rights, and special needs of tribal minorities. Migration and population expansion also must be considered (59). Regional

development is premised on the concept of increased social equity. (see Premise 10).

The Organization of American States regional planning unit has evolved a simplified, regional approach which includes the following three elements (16):

Diagnosis - A rapid analysis to determine the principal problems, potentials, and constraints of a region. the development diagnosis can include evaluation of natural resources and socio-economic conditions; delineation and analysis of subregions; identification of critical institutions, sectors, and geographic areas; generation of new information; and assembling ideas for investment projects.

Strategy - Selection of pressing issues and opportunities for addressing them with the resources available. These opportunities suggest actions that are politically feasible within a time frame short enough to maintain momentum. (Less critical issues can be left for another round.) Alternative strategies can be presented so the government has a choice.

Projects - Preparation of interrelated investment projects to implement the selected strategy. The projects provide a balance among infrastructure, production activities, and services.

In the planning model OAS uses, the resource management specialist has three main important tasks in the development process: identifying the natural goods and services available from the regional ecosystems, identifying potential conflicts in the use of these goods and services, and helping to resolve those conflicts given the socio-economic policies in force in the region. If the potential conflicts are identified early in the planning process, before much money is spent or positions are hardened, they tend to be easier to resolve (16).

In selecting the boundaries for the Regional Unit Initiative many factors have to be considered, including existing political subdivisions and traditional ways of regional thinking. But to the extent possible for CAMP purposes, the region should reflect the natural boundaries of the landscape. Baker and Kaeoniam (1986) recommend for Thailand that the landforms and ecosystems provide practical units for the identification and analysis of land and water resources (5). Within each unit, information should be collected on: a) the functions that the component landforms and ecosystems serve, b) the goods (wood products, fish larvae for aquaculture) and services (nutrient exchange, control of erosion) they provide, and c) factors which influence their development and which form the elements for

management controls and the investments required to exploit coastal resources on a sustainable basis.

Beach Erosion: One contemporary planning solution to anticipated beach recession problems is the concept of "retreat" which follows these steps: 1) predict how far back the beach will erode in the future (say 50 years from now); 2) identify this line on appropriate maps, and 3) prohibit any building seaward of this line. (Note: the line needs to be recalculated every 5 - 10 years). Continued severe beach recession is certain and predictable along much of the coast. It is unwise to allow development of property that will certainly be lost to the sea, specially when the security of buildings so often creates demands for groins, bulkheads, and other protective works, which may further imperil the whole beach system. Therefore, your CAMP programs should attempt to have structures located behind a setback line that accommodates the predicted long-term recession rate of the beach (26).

The following is a simple set of beach protection rules that can be incorporated in any CAMP program -- these are the :seven golden rules" of Hayes (21).

1) Understand the natural beach system before it is altered. Site specific studies may be required at many localities to insure wise planning decisions.

2) Develop a setback line before construction begins.

3) Where a major obstruction to longshore sand transport is built, such as a large harbor, allow for an adequate sand-bypassing system.

4) Where possible, use soft solutions, such as sand nourishment or diversion of channels, rather than hard solutions, such as revetments or seawalls,to solve beach erosion problems.

5) Maintain a prominent foredune ridge.

6) If a beach is valuable for tourism, recreation, or wildlife habitat, do not mine the sand from dune, beach, or nearshore.

7) Do not panic after a storm and drastically alter the beach. Whenever possible, let the normal cycle return the sand.

An added, eighth rule, is to use the best professional expertise available; i.e. engineers or geologists with extensive experience in solving beach problems. Beach management is not a job for under experienced or amateur practitioners.

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APPENDIX - TABLE 1

Table 1

Coastal Ecosystems in Indonesia

CATEGORY	POSITIVE VALUES, FUNCTIONS & USES	DETRIMENTAL USES & PRACTICES	ADVERSE ENVIRONMENTAL CONSEQUENCES
Agroecosystems	food production livestock production timber products fuel fish production	short cycle slash & burn (swidden) agriculture overgrazing by livestock overexploitation/clear cutting of forests inappropriate application of fertilizers, pesticides & herbicides deforestation	soil erosion loss of soil fertility sedimentation downstream pollution & contamination within ecosystem and downstream reduced production within ecosystem and downstream infilling of wetlands, estuaries, seagrass, reefs
Tambak	increased fishery production increased income, living standards increased per capita protein consumption	unnecessary conversion of mangroves & other valuable coastal systems water pollution, poor siting, excessive pesticide uses	loss of fishery resources reduced prawn & milk fish fry (and natural stocking) reduced marketability
Freshwater ecosystems (including lakes, marshes, rivers, wetlands, streams)	natural flood control & storage water supply and recharge nutrient and sediment sinks, water bird habitat food production building & energy materials	conversion to dry land conversion to wet agriculture sedimentation from soil loss irrigation withdrawal flood control channels	increased flooding degradation of habitat infilling & water pollution downstream infestation by aquatic weeds reduced fishery yields reduced water quality

Source: Ref. No. 12

Table 1 (continued)

Beaches (including associated beach forests)	nesting habitat for birds, sea turtles pupping habitat for dugongs? recreation tourism fishing habitat (recreational & subsistence) timber & fuel protection from coastal hazards	coastal structures aggravating beach erosion exploitation of eggs & adult turtles excessive beach & reef mining conversion of beach forest & dunes to urban use oil pollution	decline in sea turtles loss of beaches degraded tourism value damage to coastal structures & buildings reduced fishery values water pollution from eroded beaches loss of habitat, timber & fuel increased coastal erosion
Estuaries (including associated mud flats and embayments)	nutrient influx to coastal waters fisheries production nursery & spawning areas for many coastal fish links to mangroves, seagrasses, pelagic & demersal fisheries	urban pollution (sewage, thermal) industrial pollution hydrologic modifications (upland irrigation and water withdrawal) conversion to tambak & fast land over exploitation of resources	reduced fishery production reduced habitat for adults and fry of fishery species infilling & sedimentation reduced estuarine habitat degradation of water quality
Tidal swamp forests	habitat for fish, wildlife & plants flood storage links to mangroves timber and fuel links to rice culture fisheries production	excessive logging conversion to tambak conversion to dry land reclaimation & irrigation destruction of mangrove buffer inappropriate channelization transmigration sites	reduced fishery yields reduced timber & fuel degradation of habitat loss of wildlife & plants reduced rice yields disruption of hydrologic regime, acid soils, loss of peat

Source: Ref. No. 12

Table 1 (continued)

Mangroves	sediment filter nutrient filter fishery resources (fin & shellfish) net transfer of production to coastal fisheries breeding & spawing grounds for many coastal species nursery ground for coastal & estuarine species links to seagrass, coral reefs shoreline protection buffer for tidal swamps timber fuel tanning & other chemicals	transmigration sites conversion to dry land excessive upland soil erosion overexploitation of wood overexploitation of fishery resources upland irrigation & water withdrawal oil pollution	degraded coastal water quality loss of most values, functions & uses loss & degradation of habitat due to sediment infilling reduced fishery production reduced fry production reduced nursery habitat secondary impacts to reefs, seagrasses, swamps
Seagrass beds	nutrient filter net transfer of production to coastal fisheries feeding habitat for green turtles, dugongs, nursery grounds for coastal fisheries links to mangroves, coral reefs fishery production, esp. finfish	coastal urban pollution-- thermal & domestic sewage industrial pollution coral mining (excessive) excessive upland soil erosion overexploitation of fisheries inappropriate coastal development construction & dredging oil pollution	degradation of habitat loss of habitat due to infilling loss of habitat due to hydraulic changes displacement of seagrasses reduced fishery production loss of fry & breeding habitat

Source: Ref. No. 12

Table 1 (continued)

Coral reefs	links to seagrass, mangroves, beaches & coral islands shoreline protection beach sand replenishment, production high internal productivity shellfish production finfish production spawning grounds for fish nursery grounds for fish tourism & recreation ornamental species (shells, corals, fish, etc.) sea weed harvesting mariculture	excessive coral mining sedimentation dredging & filling over exploitation industrial discharges fishing with poisons & explosives urban pollution oil pollution water pollution	coastal erosion degraded tourism loss of nursery and spawning habitat for fish destruction from sedimentation, filling & dredging degradation from water pollution destruction of habitat
Demersal ecosystems	high productivity in up-welling areas & coastal areas high prawn and finfish production	overexploitation excessive coastal pollution oil pollution inappropriate fishing techniques	loss of fishery habitat reduced fishery production degraded & tainted catch
Pelagic Ecosystems	high productivity in up-welling areas high yield migratory species	overexploitation oil pollution	reduced fishery production degraded & tainted catch

Source: Ref. No. 12