Methodologies, Tools and Best practices for Managing Information for Decision-Making on Sustainable Development in the Caribbean SIDS.

Decision-making on Integrated Coastal Zone Management

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1 INTRODUCTION TO INTEGRATED COASTAL ZONE MANAGEMENT

Management of coastal areas involves multiple problems and sources of those problems, multiple objectives to produce desired (and often conflicting) outputs from the use of coastal resources. This involves different productive capacities over space and time, greater or lesser linkages to upstream areas and, multiple constituencies, stakeholders, and institutions with varying responsibilities for different elements of management. Integrated coastal zone management (ICZM) is a continuous, interactive, adaptive, participatory, consensus-building process comprised of a related set of tasks, all of which must be carried out to achieve a desired set of goals and objectives, however they are specified.

The relevant context for ICZM is one that is continuous over time and adaptive to new information and changing circumstances (e.g., public preferences and policies, economic conditions, new technology, new scientific understanding). ICZM planning and implementation cannot be a one-time activity, but must be part of an adaptive management process. Simply determining what can be done to manage current conditions and the costs to achieve desired objectives today is not sufficient. Attention must be given to (1) effective institutional arrangements for continuous management, (2) new incentives, positive and negative, to induce changes that will fulfill desired objectives, and (3) creative means for financing ICZM over time (Bower, Ehler, and Basta, 1994).

If ICZM is to be achieved, a common framework must exist across coastal planning sectors for making economic and demographic projections, developing future scenarios, and using similar analytical techniques for analyzing benefits and costs of alternative management strategies. Achieving such a common framework is difficult, since rarely does a single institution exist--at any level of government--with overall responsibility for integrated planning and development of action programs across the various sectors of coastal economies. (Cicin-Sain and Knecht 1998).

2 OVERVIEW OF THE CARIBBEAN SITUATION

The English-speaking Caribbean exhibits striking differences as well as similarities. There are differences in landmass, for example Guyana accounts for 79% of the total landmass while Monserrat occupies only 0.04%. Significant variations also exist with respect to population size and densities, with Jamaica, Trinidad and Tobago and Guyana accounting for 77% of the population. Barbados has the highest population density of 640.3 per km^2 while Guyana has the lowest of 3.2 per km^2. Other elements of variation include the high levels of unemployment, per capita external indebtedness (particularly in the larger countries of Guyana, Jamaica, Trinidad and Tobago and Barbados) and per capita income (which ranges from UD$13,000 in The Bahamas to US$400 in Guyana) (Springer, 1998). All of the Caribbean countries have a high dependence on resources-based economic activities developed primarily for the overseas market such as agriculture, tourism and industry (including mining, quarrying and petro-chemicals).

Socially the countries are characterized by high levels of under employment and unemployment (the latter ranging from 10% to 40%) high poverty levels ranging from

6% to 40% and increasing urbanization in coastal cities where social conditions are for the most part stressful, especially for poor households. A high proportion of the poor live in areas that are highly susceptible to the effects of soil erosion, land degradation, floods and other ecological disasters,

Institutionally the island have similar decision-making cultures that has been heavily influenced by history, As a result of this, decision-making tends to be heavily centralized in the capital cities with little decentralization to outlying communities with often little input of the community level. The Caribbean is faced with the challenge of determining how to pursue sustainable development in a situation of limited resource endowment, harsh externalities, unfavourable internalities, low economic growth, weak institutional capacity and the rising expectations of a rapidly increasing population (Springer, 1998). It is against this background that the sustainable use of coastal and marine resources will be examined within the context of integrated coastal zone management (ICZM).

3 THE COASTAL AREA

3.1 The Coast

In the broadest sense the coast is the place where the waters of the seas meet the land. The coast represents a mosaic of rich and diverse ecosystems and resources and is important to the economic and social well-being and development of countries of the region. The combination of freshwater and salt water in coastal estuaries creates some of the most productive and richest habitats; the resulting return in fishes and other marine life is of great value to coastal nations. The coasts are highly valued and greatly attractive as sites for resorts and as vacation destinations. In many locations, the coastal topography formed over the millennia provides significant protection from hurricanes, tropical storms, and their ocean-related disturbances. Hence, for most coastal nations, the coasts are an asset of incalculable value and an important part of the national heritage. (Cicin-Sain and Knecht, 1998).

3.2 Definitions of the Coastal Zone

Defining the coastal zone has always provided a challenge to SIDS. Where does the coastal zone begin and ends? The definition is variable and tends to depend upon the problem, subject area or ecosystem under consideration. The coastal and oceanic environment is a complex web of interacting natural and man-made systems. In addition socio-cultural, economic, environment, legal and scientific issues pertaining to these systems cannot be spatially or geographically delineated.

The coastal zone is the transitional area between land and sea. It is defined, as a strip of land and sea of varying width depending on the nature of the environment and management needs. It seldom corresponds to existing administrative or planning units. The natural coastal systems and the areas in which human activities involve the use of coastal resources may therefore extend well beyond the limit of territorial waters and many kilometres inland. Thus, for practical planning purposes, the coastal zone is a special area endowed with special characteristics, of which the boundaries are often determined by the specific problems to be tackled

Cicin-Sain and Knecht, (1998) identified five main zones in the coastal-marine spectrum:

- *inland areas*, which affect the oceans mainly via rivers and non-point sources of pollution;
- *coastal lands*--wetlands, marshes, mangroves, swamps, flood plains, Beaches, dines, wave-cut platforms, cliffs, rock ledges and escarpments, and associated environment - where human activity is concentrated and directly affects adjacent waters;
- *coastal waters*--generally estuaries, rivers, streams, lagoons, and nearshore waters, sea bed and reef - where the effects of land-based activities are dominant,
- *offshore waters*, mainly out to the edge of national jurisdiction (200 nautical-miles offshore); and
- *high seas*, beyond the limit of national jurisdiction.

From a holistic point of view the "coastal zone" does include the land, seabed, marine waters, terrestrial waters and aquifers, atmosphere above, and associated areas of vegetation, animal habitat, and human activity

In Jamaica for the purpose of it coastal zone policy the ***coastal zone*** is defined as "The coastal zone pertains to the entire area influenced by and influencing coastal and ocean resources and ecosystems" (Ministry of Foreign Affairs, 2001)

4 CARIBBEAN COASTAL ECOSYSTEMS, INTERACTIONS AND PROCESSES

The coastal ecosystems in the Caribbean are extremely valuable, as they possess natural resources, which provide countless and important goods and services to human. The coastal and marine areas of the Caribbean contain some of the worlds most diverse and productive resources. They include extensive and complex habitats and ecosystems (such as estuaries, coral reefs, sea grass beds) that provide goods (e.g., fish, oil, minerals) and services (e.g., natural protection from storms and tidal waves, recreation) to coastal communities. These ecosystems are the source of significant proportion of food production and support a variety of economic activities including fisheries, tourism and related uses including recreation and transportation. (UNEP, 1989)

4.1 Coastal Habitats

4.1.1 Coral Reefs

Coral reefs are the most taxonomically diverse of all marine ecosystems. They probably contain at least a million species, but fewer than 100,000 of these have been described. The word reef has many meanings. Marine biologists use the term to describe a wave-resistant structure dominated by a strong and rigid mass of living (or once living) organisms. Not all reefs are built of coral; other reef builders include red and green algae, cyanobacteria, worms, and even oysters.

In the simplest sense, coral reefs are wave-resistant piles of limestone and calcareous sediments built by a thin veneer of living organisms-individual living coral animals termed polyps. These piles are of great ecological and resource significance for their habitat heterogeneity, extremely high biodiversity, and distinct trophic structure and primary production. A polyp feeds by two methods, one by capturing and eating

plankton that drift within reach of its rosette of tentacles. The other food source consists of the organic products produced by symbionts. Coral bodies contain masses of tiny symbiotic dinoflagellates algae called zooxanthellae. The microscopic zooxanthellae carry on photosynthesis, absorb waste products, grow, and divide within their coral host. The coral animal provides a safe and stable environment and a source of carbon dioxide and nutrients (its wastes); the zooxanthellae reciprocate by providing oxygen, and organic compounds.

Reef corals can be found most prolifically in clear, warm, shallow, and nutrient-poor waters about 5 to 10 meters deep. They prefer clear water because turbidity caused by suspended sediments, prevents light penetration, which the zooxanthellae need for photosynthesis, and because suspended inorganic particles interfere with feeding by the polyp tentacles. Coral reefs tend not to be found in areas of upwelling or nutrient inputs from land based sources such as fertilizer from agriculture. Nutrients fertilize phytoplankton whose increased growth inhibits reef development by 'shading' due to the reduced water transparency caused by algal blooms.

Coral reefs play a significant role in preventing coastal erosion and storm damage. Under natural conditions they act as self-repairing breakwaters. The reef ecosystem has a complex interaction with the seagrass and mangrove ecosystems. The sheltered back reef provides low energy conditions required for the development of seagrass communities.

4.1.2 Mangroves

Low, muddy coasts are often home to tangled masses of trees known as mangroves. Simply put, the term *mangrove* refers to any woody, tropical halophyte (salt-loving plant) that is an obligate inhabitant of wetlands. These large, flowering plants are never completely submerged, but because of their intimate association with the ocean are often considered to be marine plants. Occurring at the interface of land and sea, mangroves encompass elements of both terrestrial and marine environments. Mangroves assume a variety of life forms reflecting the diversity of their origins thus, they can range from squat, scrubby stands on exposed flats, to 40-meter-tall forests lining the alluvium of river mouths.

The sediment in which mangrove trees live must be covered with brackish or salt water for part or all of the day. The fine coastal muds they colonize do not provide firm footing for tree-type mangroves; so an intricate network of arching prop roots is required for support. The root system also traps and holds sediments around the plant by interfering with the transport of suspended particles. Mangrove forests thus assist in the stabilization and expansion of deltas and other coastal wetlands and also provide enormous and often under-valued coastal protection benefits (against storm surges, erosion, etc.). The root complex also forms a nearly impenetrable barrier, and so provides a safe haven for organisms around the base of the trees. They also harbor sponges, barnacles, oysters, and snails. Perhaps most importantly, they serve as important breeding grounds for certain types of shrimp and commercially valuable fishes, as well as providing a "nursery" for juveniles.

4.1.3 Seagrass

Many people lump seagrasses in with seaweed, but their resemblance to seaweed is only superficial. Seagrasses are angiosperms, i.e., advanced vascular plants that reproduce with flowers and seeds. The life cycle of seagrasses is much like that of other angiosperms, but their stringy pollen is distributed by flowing water rather than by insects or wind.

Angiosperms originated on land, and only a few species (there are between 50-60) have recolonized the ocean. But those species that have are fairly successful; seagrasses occur in shallow soft-sediment habitats along the shores of bays and estuaries, and off coasts, throughout most of the world. Seagrasses are primarily subtidal (below the low-tide line) but some species can stand being exposed to air for long periods, and so extend also into the intertidal zone. Anchored to bottom sediments by a network of roots and rhizomes and structured with a dense arrangement of stems and leaves, seagrasses create a habitat for many other aquatic organisms. The thick foliage affords prey protection from predators and shelters organisms from strong currents and wave action. Thus seagrasses are ecologically significant, both because of their high primary productivity, and their value as habitat formers.

Animals in every major Phylum occur within seagrass beds. They pack the complex belowground mat of seagrass roots and rhizomes and live attached to or closely associated with the leaves. More mobile snails, crabs, and fishes cruise through or above the leaf canopy. Seagrass beds also support large populations of migrating waterfowl, predatory wading birds, diving ducks and raptors. Large vertebrate grazers such as green turtles, dugongs, and manatees rely on seagrass beds for food and habitat; some of these species are threatened or endangered. The majority of commercially valuable species are found in seagrass communities at some stage in their life histories.

4.1.4 Estuaries

Estuaries are low salinity areas where rivers merge slowly with marine water under low energy conditions and tend to occur in semi-enclosed areas such as bays. The estuarine environments all have some basic features including the following; a restricted opening (seaward mud or sand bar), an area of various species of low growing vegetation (reeds etc), which will lead to a transitional zone of freshwater swamp or swamp forest. They function as nursery areas for shrimp and fish, and provide habitats for a variety of fish, crustaceans and mammals. Estuaries also provide an anchorage for boats due to the calm conditions. Most Caribbean countries in particular smaller islands do not have extensive estuarine systems given their comparatively low levels of riverine discharge. Estuaries are highly productive ecosystems because fresh waters provides renewal of nutrients to the marine environment, shallow depth of estuarine areas results in maximum utilization of solar radiation and the high level of mixing facilitates nutrient exchange and waste removal**.**

4.1.5 Beaches and Dunes

Beaches consist of accumulated, unconsolidated sediments from offshore reefs and shoals transported to shore by wave-generated motion. Beaches are not stable entities but are

rather dynamic landforms constantly subjected to forces that promote accretion and/or erosion (Snedaker & Getter, 1985). The inter-tidal zone is the area of greatest energy and disturbance, and waves have their greatest impact on the living physical characteristics of the beach. Living organisms found in the inter-tidal zone consist of burrowing animals and those that are free moving such as crustaceans, juvenile fish and some snails. The presence of diatoms, phytoplankton and other living marine vegetative debris within the sands of the beach are major contributors to primary production. This organic material (living and decomposing) provides the energy base to deposit and filter feeding consumers (burrowing bivalves and crustaceans). Beaches also serve as food sources for many foraging species of coastal birds, and fish.

Beaches are often closely associated with vegetated sand ridges called dunes. Dunes are formed by dry beach sand blown inland and trapped by plants and other obstructions Stable sand dunes play an important part in protecting the coastline. They act as a buffer against wave damage during storms, protecting the land behind from saltwater intrusion. This sand barrier allows the development of more complex plant communities in areas protected from saltwater inundation, sea spray and strong winds. The dunes also act as a reservoir of sand, to replenish and maintain the beach at times of erosion.

4.2 Ecosystems Interactions

Island ecosystems are closely interrelated and there is significant interaction between coastal ecosystems. Coral reefs will provide low energy conditions, which facilitate the growth of seagrass and mangrove communities. By dissipating wave energy they reduce the action of currents and level of erosion of shorelines. Reefs provide sediment for the replenishment of sandy beaches, and protect them from erosion. They also provide a silt apron for the establishment of seagrass beds, which in turn stabilize sediments.

Mangroves, especially basin mangroves, act as areas of deposition of sediments and reduce the sediment load reaching the coral reef ecosystem. They also act as filters for nutrients and maintain oligotrophic conditions preferred by coral reefs. Seagrass beds and mangrove ecosystems leak or export nutrients to coral reefs. Detritus is transferred from mangrove ecosystems to both seagrass and coral reef ecosystems through tidal action and currents. There is constant migration between these ecosystems. For example, the spiny lobster *Panulirus argus*, grunts and snappers will go to mangrove wetlands to spawn.

Diagram on interactions would be useful here if possible.

5 COASTAL RESOURCE USE

Biologically productive coastal and marine resources are coming under increasing threat throughout the Caribbean. These resources generally supply major economic benefits and contribute significantly to the national economy of all the Caribbean states. The major uses of coastal resources in the Caribbean are: fisheries, tourism and recreation, urban development, shipping and transportation, industrial and manufacturing and shoreline protection. Competing interests are placing enormous demands on the limited resources of the coastal zone. Coastal areas and their resources generally suffer from

problems arising out of open access with resource allocation issues being a fundamental source of conflict. A lack of understanding of the coastal zone often results in a sectoral approach to management with overlook the dynamic character and multiuse values of the coastal area.

5.1 Fisheries and Mariculture

Fish harvesting practices in the Caribbean range from fish traps, gill nets, drag nets, trawlers as well as spear fishing, and the use of dynamite and chemicals. Overfishing and the removal of juveniles have resulted in the decline of fishable stocks. The issues and challenges facing the fisheries sector in the region include rapid population growth, growing demand for fish and fish products (fish is the most important source of protein behind chicken meat in the Caribbean) (Haughton and Singh-Renton, 2001), excessive fleet capacity, over fishing, pollution and degradation of coastal and marine habitat, unregulated and illegal fishing by local fleets, natural disasters such as hurricanes, and resultant damage to infrastructure, global warming and accompanying sea level rise (Haughton, 2002).

Additional issues include the lack of personnel and equipment for the Fisheries departments in the Caribbean and the lack of the necessary enforcement support by the relevant agencies. In addition, there is the prevalence of unsustainable fishing practices, inadequate education of the fishers and others involved in the sector. Fishers' organizations tend not to have a clear management focus and there is insufficient research to support sustainable fisheries and inadequate stock assessments.

Mariculture activities include oyster culture, Irish moss culture as well as marine cage culture of primarily tilapia and shrimp. The issues associated with mariculture activities within the coastal zone include conflicts over access, tenure and harvesting rights; pollution discharges and subsequent degradation of adjacent waters; reduction in the aesthetic appeal and the illegal cutting of mangroves.

The fisheries of the region has been supported by the CARICOM Fisheries Resource Assessment and Management Programme (CFRAMP), which was launched in 1991 to enhance the basic information and institutional capacity necessary to manage and develop the fisheries in the CARICOM region and thus promote sustainable use and conservation of the fisheries resources. Building on the achievements of CFRAMP, the Caribbean Regional Fisheries Mechanism (CRFM) was established to further promote sustainable use of fisheries and aquaculture resources by the development, management and conservation of these resources in collaboration with stakeholders (Creary, draft).

5.2 Tourism

Tourism accounts for 25-75% of the GDP in the Caribbean and the coastal areas historically have served as the regions main tourist destinations. Tourist arrivals at times exceed the number of inhabitants, e.g. Barbados in 1997, the number of tourist was 472,000; the percent of tourist to the local population was 182.4%, GNP contribution was 39.2%. Tourism provides employment for 1.2 million people (directly and indirectly) in the Caribbean and investment represents an important catalyst of land use in the coastal

area. As demands for new destinations grow so does the demand for improved to scenic coasts, which are often without basic services. Improvement in access, energy distribution and communication needed for resort development as well as prospects for employment attract new residents to the coast leading to the transformation of tradition fishing villages (e.g. Negril, Jamaica) into bustling tourist resorts. The constant drive to increase the number of visitors to the region places additional stress on limited resources and existing infrastructure such as sewage treatment facilities, supply of domestic water and solid waste disposal. These changes trigger rising property values, competition for resources and conflicts with other sectors such as fisheries and agriculture.

The growing popularity of ecotourism has led to the increase in demand for nature-oriented recreational services and access to coastal protected areas and buffer zones. More recently coastal facilities have developed to primarily promote ecotourism such as the offshore keys of Belize, with conservation measures not always implemented by hotels and the tourism industry. Likewise, the impacts on the coral reefs from the boating and diving sectors have to be taken into consideration. Ecotourism like convention tourism creates the need for improved environmental management and land use planning that often exceeds the capacity of the local management authorities. Cruise tourism, a market segment that is expanding in the Caribbean is also placing pressure on many destinations that have to provide potable water and handle the increase volume of ship-borne waste. (Lemay, 1998).

5.3 Urban Development

In 1994, World Bank experts estimated that two-thirds of the population of developing nations would be living along coasts by the end of the twentieth century (WCC 1994). The presence of large and growing populations in the coastal areas exercises increasing pressure on these areas; pressure that threatens to diminish or even obliterate the values of the coasts. With rapidly increasing populations comes the proliferation of infrastructure for the manufacturing, transportation, energy processing and consumption that these populations require, as well as the corresponding amount of the waste products. (Olsen, *et al,* 1998).

In the English-speaking Caribbean, most of the countries have their major urban centers on the coast. There are several main factors, which influence urban development and are the common driving forces in most if not or all Caribbean countries. These factors include job opportunities, infrastructure and amenities. Job opportunities are the primary factor influencing urban development. With decreased economic opportunities in the rural communities people will move into and develop areas where there are potential economic prospects. This urban migration in turn creates the demand for increased housing, hospitals, schools, roads and utilities. Also important is the accessibility to amenities such as proper utilities such as water, electricity and telephone, and access to business and commercial centers.

5.4 Sand Mining

Beaches and dunes as well as river mouths are the primary sources of sand for building. Indiscriminate sand mining from rivers, dunes and beaches is a major problem affecting

the stability of the coastal resources. This activity is illegal in many countries but despite the existence of the relevant laws enforcement is ineffective. The main issues related to the illegal removal of sand are changes in river courses, diminished coastal protection, destabilization of riverbeds, beach erosion, increased turbidity and flooding.

5.5 Ports, Industrial Development And Shipping

The ports of the Caribbean have been a significant factor in land use changes in the coastal zone. Ports have traditionally served as a magnet for manufacturing and processing activities, often contribution to the urbanization and increased industrial character of the coastal areas. Ports concentrate maritime traffic where they can conflict with the marine areas such as fisheries and tourism. Port operations including maintenance dredging and the disposal of dredge material and ship borne wastes, have significant effects on the coastal environmental quality. Increasing traffic increase the likelihood of accidental spills placing the coastal environment at high risk. Maritime transport is also a source of ship-generated marine debris in the Caribbean.

Urban waterfronts support infrastructure such as processing and power plants, wastewater treatment facilities, refineries and other industrial facilities that use coastal area as receiving waters for treated and untreated effluent. Dependent on the prevailing currents as well as the volume and composition of the effluent, there can be an impact on other activities dependent on marine water quality.

6 CHALLENGES TO SUSTAINABLE DEVELOPMENT IN THE COASTAL ZONE

6.1 Marine Pollution

Marine pollution stems from multiple sources with the territorial limits of the region. The different types of contaminations include petroleum and its derivatives; minerals contaminants including those form plant for mineral processing, urban and industrial contaminant and agricultural contaminants. Marine pollution prevails in many ports (e.g. Kingston, Port of Spain) where marine sediment in harbours retain substantial concentration of heavy metals (such as copper, cadmium. chromium. lead, zinc and mercury) as a result of waste disposal activities and discharge practices. Dredging disturbs these contaminated sediments causing them to enter the water column where they are of ingested by marine organisms such as shell fish, thereby entering the food chain.

Pollution of coastal waters can greatly reduce the production of fish, as can degradation of coastal nursery grounds and other valuable wetland habitat. The storm protection afforded by fringing coral reefs and mangrove forests can be lost if the corals die or the mangroves are removed. Inappropriate development and accompanying despoilment reduce the attractiveness of the coastal environment, greatly affecting tourism potential. (Chua, 1993: 81).

6.2 Waste Disposal

Liquid and solid wastes are by for the major cause of coastal pollution in the English-speaking Caribbean. The growth in urban population, industrial activity and tourism has

outstripped infrastructural capacities to handle waste. In the absence of adequate sewage collection systems, waste treatment has in many instances been undertaken in an ad hoc and unsanitary fashion. Septic tank effluent is sometimes disposed of in storm drains and in some instances directly into coastal waters. Few of the islands have municipal tertiary treatment for sewage. Improperly sited sea outfalls are still the predominant disposal method. Where sewage treatment facilities have been installed, there are deficiencies in plant capacity, plant operation as well as maintenance and monitoring practices.

Improper disposal of industrial waste water has for some time been a important cause of marine pollution and include waster from refineries and petro-chemical plants, sugar factories and rum distilleries, breweries, abattoirs, tanneries, textile industries, edible oils and detergents factories, power plants, paint manufacture and banana washing and packing. In most cases the management techniques in these industrial operations are not focused on waste education, recycling or recovery. The absence of water quality standards in a number of countries also serves to exacerbate the negative environmental impact of industrial and agricultural wastes.

Pollution from land based activities, as well as from oil and gas extraction, by impairing productive fisheries well as viable tourism areas, represent serious threats to sustainable economic development. Throughout the region, land-based pollution is damaging near-shore marine habitats, fouling recreational swimming areas and creating public health hazards. Pollution is accelerating as urbanization overtakes the capacity of the existing municipal infrastructure resulting in inadequate treatment of domestic and industrial effluent. Even where sewage infrastructure is present plant operation and maintenance are often inadequate, as are the monitoring of effluent and the enforcement of effluent standards (Springer 1998).

6.3 Degradation of Coastal Ecosystems

Poverty is the primary cause and effect of environmental degradation. For those whose livelihood is linked to an aquatic resources base, unproductive and degraded coastal and marine habitats impede the possibility of rising beyond subsistence levels. Conversely, poverty itself poses one of the greatest threats to the natural environment for day-to-day survival is the highest priority for the poor. At the other extreme, the region is also experiencing wildlife destruction as a result of large-scale development due to the elimination or modification of habitat. Secluded sandy beaches have given way to tourism or other forms of development, reducing turtle nesting habitats. Mudflats, salt ponds and coastal lagoons have been filled to provide sites for urban development eliminating breeding grounds for marine organisms and birds. (UNEP, 1989).

Beaches and dunes perform vital functions in protecting uplands from the effects of hurricanes-induced storm surges and coastal flooding. They provide the habitat for a wide range of flora and fauna and are particularly important as nesting sites for sea turtles. Sanding mining is a predominant cause of beach and dune destruction throughout the Caribbean. The mined sand is generally used in the construction industry for mixing with cement. Coastal construction can also threaten beach and dune stability. The construction of groins, sea walls and jetties are often constructed without understanding

the dynamics of localize ocean currents and have been detrimental to beach replenishment. Shore and beach erosion has bee identified as a significant problem along the north coast of Jamaica and the East Coast of Trinidad. (UNEP, 1989).

Land conversion combined with the expansion of coastal infrastructure is contributing to the degradation of coastal habitats. Mangrove forests, which represent an important link in the primary and secondary productivity of nearshore areas, have been disappearing at high rates throughout he region. As much as 55% of the entire mangroves coast of Latin America and the Caribbean was classified as either critical or endangered, 30% as vulnerable and only 15% as stable. (Lemay, 1998)

6.4 Ecosystem Management

Governments of the region have been caught between the pressures of poverty on one hand and development on the other; and have hence been ineffective in implementing programmes for resources enhancement and wildlife protection. Though some parks and protected areas have been established active management that includes monitoring and enforcement remains insufficient. (Lemay, 1998)

6.5 Depletion of Commercial Fisheries Stock

Fisheries in the Caribbean face mounting problem including depleted stocks, overcapitalization and plant closures, habitat degradation, non-compliance with management regulations and illegal practices, and increasing competition between artisanal and industrial fleets. More than 80% of the commercially exploitable stocks in the South western Atlantic and 40% in the South eastern Pacific are wither fully fished are either fully fished, overfished or depleted. The effects of fisheries by catch in marine biodiversity and fisheries sustainability are also a growing concern.

6.6 Hazards and Disasters

The region is subject to a range of natural disaster that include earthquakes, riverine flooding, volcanic eruptions landslides and subsistence, hurricane induced storm surges and high velocity winds and drought. Volcanic eruptions of Mont Pelee in Martinique (twice in 1902) claimed 30, 000 lives. The Soufrière of St Vincent erupted in 1902 and again in 1979. Volcanic eruptions in Montserrat, over the period 1995 to1998 claimed 19 lives and rendered two thirds of the island inhabitable. Disastrous earthquakes have occurred in Jamaica and Hurricanes regularly devastate the islands of the Caribbean. (UNEP, 1989)

Global climate change is expected to induce permanent climate change in the Caribbean region as well as increase in extreme weather events. However, most projections on the regional level suggest that permanent climate shocks to the Caribbean countries are expected to include sea level rise, higher surface air and sea temperatures; extreme weather events such as tropical storms and hurricanes and more “El Niño-like” conditions are also expected to become either more frequent and more severe, or both; rain intensity is also expected to increase, leading to both more frequent as well as more severe flooding events.

The changes that are predicted as a result of climate change are expected to result in the loss of livelihood and to affect the regions resource base, damaging natural ecosystems and man-made infrastructure. Beaches, wetlands and other coastal lands could be lost to rising sea level and higher storm surges. Coral reefs may be lost due to higher water temperatures; leading to changes in fish stocks while some agriculture crops may become less productive with climate change. Long-term changes in rainfall patterns and evaporation may affect the availability of fresh water supplies. There is a risk of damage to building, roads sewer and water systems, port facilities and other infrastructure due to rising sea levels, higher storm surges and more intense tropical storms. Flood damage from heavy rains may also occur, and may increase with increased intensity of extreme weather events. (MACC, 2003).

6.7 Land Use Conflicts

Different coastal and ocean uses such as fishing and offshore oil development, also often conflict with or adversely affect one another. Two major types of conflicts related to coastal and ocean resources can be noted: (1) conflicts among users over the use or non-use of particular coastal and ocean areas and (2) conflicts among government agencies that administer programs related to the coast and ocean. By users we mean both direct, actual users of the coast and ocean (e.g., oil operators and fishermen), and indirect or potential users (e.g., environmental groups that promote the non-utilitarian values of the coast and ocean, members of the public who live in other areas, and future generations). Because most marine resources are public property and there is an important public, or societal, interest in the management of the land-side of the coastal zone, the rights and interests of such indirect users must also be taken into account (Cicin-Sain, 1992).

Some of the more typical reasons for conflict among users include (1) competition for ocean or coastal space; (2) adverse effects of one use, such as oil development, on another use, such as fisheries; (3) adverse effects on ecosystems; and (4) effects on onshore systems, such as competition for harbour space. Conflicts also occur among government agencies that administer programs related to the coast and ocean, including both interagency conflicts (among agencies at the same level of government, whether national or local) and intergovernmental conflicts (or among different levels of government). Agency conflicts occur for a variety of reasons, including divergent legal mandates and different missions; differences in agency outlook and type and training of personnel; differences in external constituency groups; and lack of information or communication (Cicin-Sain, 1992).

Because of the massive largely unplanned investment in sectors such as tourism, port expansion, industrial facilities the coastal areas of the Caribbean are the target of accelerated land use change and the conflicts associates with such change. Activities complete for the same resources on which the coastal communities traditionally depend. In the absence of clear management framework, fisheries resources, coastal lands, beaches, mangroves, coral reefs are depleted, encroached upon or overused. These trends lead to conflict and can lead to escalating prices, exposure to corruption, displacement of traditional users and even civil unrest. (Lemay, 1998).

7 INTEGRATED COASTAL ZONE MANAGEMENT

7.1 Rationale for integrated coastal zone management

The coastal zone is a magnet for coastal development; residential, industrial and commercial uses all compete for space with the main concentration being adjacent to the coastline. Pressure for coastal development has been aggravated by the migration of population from the rural areas to the coastal urban areas. Haphazard, unplanned and unregulated urban growth, represent a growing threat to the sustainability of the fragile coastal and marine ecosystems. To avoid irreparable damage to the natural systems, urban growth policy needs to closely coordinate the policies and integrated the planning for the management of the coastal and marine resources.

7.2 The Integrated Coastal Zone Management Process

Management is a ***continuous, interactive, adaptive, participatory process*** comprised of a set of related tasks, all of which must be carried out to achieve a desired set of goals and objectives, however those goals and objectives are established and specified.
Management of coastal areas must deal with at least the following factors:

- multiple and conflicting demands on the coastal area, stemming from within, and external to, the designated management area;
- human population increases and associated demand for economic development within the coastal area, including, e.g., the filling of shallow, nearshore waters for use for various purposes;
- the stochastic (probabilistic) nature of natural events, including the frequency distribution of quantity and quality of freshwater inflows to the ICZM area and the frequency distribution of intensity and duration of storm events and other natural phenomena;
- rate and magnitude of natural processes, e.g., shoreline erosion and accretion, ecological succession, land subsidence or uplift;
- limited resources for management, because of multiple demands by society for outputs and services (other than those derived from management of coastal resources);
- uncertainties about all of the variables involved in ICZM, e.g., governmental policies and programs, demographic and economic conditions and trends, social tastes and attitudes, external and internal demands on coastal resources, technological changes, and factor prices; and
- potential climate change and its long-term effects on coastal ecosystems and on human activities in the ICZM area.

Integrated coastal zone management (ICZM) represents a cross-sectoral, inter-agency, and multidisciplinary approach to the many and varied issues affecting the biological and physical and social resource base within the wider coastal and oceanic environment. (Cicin-Sain and Knecht, 1998).

8 CONSIDERATIONS FOR INTEGRATED COASTAL ZONES MANAGEMENT

8.1 Dimensions of Integration

With reference to the coastal-marine spectrum outlined in Section 3.2 local, government interests tend to predominate in inland areas, whereas there tends to be a mix of local and national interests on coastal lands and in coastal waters. Moving farther out, ultimately to offshore waters and the high seas, national and international interests become most important. The nature of government institutions also differs in the various zones. On land, there are often well-established "multiple-purpose" government institutions at the local levels to address such questions as control of land use and conflicts among uses. On the water side, there tends to be only "single-purpose" national agencies operating, each concerned primarily with a single use of the ocean, such as fisheries operations or oil and gas extraction. Given these differences, management of the five zones of the coastal marine spectrum may require common and complementary, yet somewhat differentiated, approaches and institutions. Therefore several dimensions of integration need to be addressed as a part of an ICZM process:

Inter-sectoral integration*:* Integration among different sectors involves both "horizontal" integration among different coastal and marine sectors (e.g., oil and gas development, fisheries, coastal tourism, marine mammal protection, port development) and integration between coastal and marine sectors and land-based sectors that affect the coastal and ocean environment, such as agriculture, forestry, and mining. Inter-sectoral integration also addresses conflicts among government agencies in different sectors.

Intergovernmental integration**:** Integration among different levels of government (national, provincial, local). National, provincial, and local governments tend to play different roles, address different public needs, and have different perspectives. These differences often pose problems in achieving harmonized policy development and implementation between national and sub-national levels.

Spatial integration**:** Integration between the land and ocean sides of the coastal zone. There is a strong connection between land-based activities and what happens in the ocean involving water quality, fish productivity, and the like; similarly, all ocean activities are based or dependent on coastal land. Different systems of property ownership and government administration predominate on the land and ocean sides of the coastal zone, often complicating the pursuit of consistent goals and policies.

Science-management integration**:** Integration among the different disciplines important in coastal and ocean management (the natural sciences, the social sciences, and engineering) and the management entities. Although, the sciences are essential in providing information for coastal and ocean managers, there often tends to be little ongoing communication between scientists and managers. (Here, the sciences refer mainly to the natural

sciences concerned with the oceans and coasts, such as oceanography, coastal processes, and fishery sciences; the social sciences, concerned with coastal human settlements and user groups as well as management processes that govern ocean and coastal activities; and coastal and ocean engineering, which focuses on all forms of coastal and ocean structures.)

***International integration*:** Integration among nations is needed when there are international disputes over fishing activities, transboundary pollution, establishment of maritime boundaries, passage of ships, and other issues. Although in many instances, coastal and ocean management questions are within the purview of national and sub-national governments within national jurisdiction zones (200 nautical mile EEZs, extended fishery zones), in many other cases, nations face ocean and coastal management problems with respect to their neighbours and thus need internationally negotiated solutions. Typically, the national government plays the leading role in such negotiations.

8.2 Governance Issues

One of the most important lessons learned from the history of ICZM is that horizontal and vertical integration is both the practice's keystone and its largest challenge. Often, either vertical or horizontal integration requires a new commitment to power sharing. Horizontal integration means that disparate functions (planning, permit letting, budgeting, development) must be coordinated. Again, this requires levels of cooperation, which may be new for leaders of narrowly focused sectoral agencies. Similarly, local and regional units of government that exercise the power of land use planning and regulation have fought against vertical integration programs proposed by states or provinces and nations.

When ICZM is introduced into a national or sub national unit, it always will be a vulnerable fledgling, and as such, at the mercy of the bureaucratic pecking order. If the program is to survive and grow, government unit directors must learn how to convince other institutions that it is in their self-interest to voluntarily coordinate. Government leaders, particularly those who are veterans of electoral politics, need to be persuaded that government integration is not a sign of weakness or an abdication of responsibility, but rather a strategy to advance the agenda of a sectoral agency in a way which will anticipate and avoid conflicts.

Forced integration has its political costs. Agencies and interests that are coerced into a new ICZM regime can be expected to find ways to opt out, actively undermine, or otherwise thwart implementation of its initiatives. Increasingly, it appears that proponents of ICZM must also be skilled builders of coalitions, which include multiple agencies and interest groups. Negotiation, coalition building, and the crafting of consensus agreements must be part and parcel of ICZM. There is clear evidence that even the most talented political leaders cannot impose government programs of the complexity required by ICZM. For many leaders, negotiation is second nature. However, for many others, building of consensus agreements may require a new set of tools and a new conception of policy making.

8.3 Boundary Issues

The coastal management area is usually designated through a political process explicitly or implicitly to be managed as a single unit. The management boundaries of the area usually do not coincide with the boundaries of a single ecosystem, because typically a number of ecosystems of varying sizes exist within, and may extend beyond, the designated management area. The management boundaries may or may not coincide with the boundaries of governments of general jurisdiction, i.e., governments that have powers of implementation. The boundaries will coincide with only some of the areas from which demands are imposed on the resources of the coastal area. Finally, the boundaries are not likely to delimit the influences of coastal processes on the designated area, such as sediment transport and atmospheric deposition of contaminants. Thus, the boundaries for planning and analysis for integrated coastal management (ICZM) often will not (and do not have to) coincide with the boundaries for management. (Bower *et al*, 1994)

The coastal management system, in turn, can be thought of as a system of relationships among (1) people who live, use, or otherwise are concerned (in their beliefs or behaviours) with the coastal environment, (2) policy makers and managers whose decisions and actions affect the behavior of coastal peoples, and (3) members of the scientific community: natural scientists who study the coastal environment and social scientists who study human behavior in coastal zones. Therefore, rather than define the boundaries in an absolute way it is more appropriate and practical to allow the issues under consideration to define how the boundaries will be drawn.

8.4 Global and Regional Issues

The global and regional dimension of environmental impact of action and policies related to coastal management should be recognized and considered. Nevertheless, integrated coastal zone management at the national scale is critical for achieving overall sustainability. So far most national and local actions are only remotely related to global targets and mainly represent a continuation of conventional approaches to coastal environment issues. National policies should seek to identify easy in which local activities and be designed to meet national and global targets of sustainability.

8.5 Transparency And Stakeholder Participation

Policies should be developed in a manner that allows for open review and discussion. Information and analysis that impact decision-making should benefit from public review. These would include such instruments as environmental assessments where feedback prepared by reviewers serve to establish dialogue between government agencies and involved stakeholders. In the case of complex projects, sufficient times should be permitted for the public to provide meaningful reviews and comments

Governments should establish procedures for informing stakeholders of programmes and projects that are under consideration for adoption and approval. Stakeholders should be involved in the project cycle at the earliest stage and to extent practical should have an on-going role throughout the planning and implementation process. Additionally, stakeholders having had previous access to or use of resources should receive priority consideration for management participation.

9 APPRAOCHES TO INTEGRATED COASTAL ZONES MANAGEMENT

9.1 Inter-sectoral Strategies

Agenda 21 calls for states to consider establishing (or strengthening) appropriate coordinating mechanisms (such as a high-level policy-planning body) for integrated management and sustainable development of marine and coastal areas at both the local and national levels and to consider strengthening (or establishing) national oceanographic commissions to catalyze and coordinate the needed research.

Some options for establishing coordinating mechanisms include creating an interagency committee, naming a lead agency, creating a new agency, and training agency personnel to instill an integrated rather than a sectoral perspective. Some specific examples at the national level would be the following:

- *Creation of a special inter-ministerial coastal coordinating council or commission*. This is often a good approach, provided the political will can be generated to create a new government entity of this kind. Important questions of composition, staffing, and funding of a new office have to be determined.

- *Assignment to an existing planning, budget, or coordination office*. This can be a satisfactory approach in certain government settings, provided the designated office is at a level above that of the line ministries or departments. The high-level location usually provides adequate legal authority and appropriate legitimacy, but such an office is likely to have other goals (e.g., monitoring or controlling the national budget) that could interfere with timely performance of ICZM functions.

- *Designation of an existing line ministry to act as lead ministry*. The challenge in this type of arrangement is to vest sufficient authority in the lead ministry that it has effective control over the activities of sister ministries with regard to ICZM decision making.

These three conditions, if fulfilled, would enhance the effectiveness of the integrated coastal management process. The coastal management entity and process should be at a higher bureaucratic level than those of the sectoral agencies so it has the necessary power to harmonize sectoral actions; the effort should be adequately financed and separately staffed; and the planning aspect of integrated coastal management should be integrated into national development planning.

9.2 Policy Setting Tools

Policy setting is a widely used tool when developing integrated policies, such as Integrated Coastal Zone Management (ICZM)). The process of policy setting for integrated environmental management is cyclic, evolves in time and can be described in a number of phases. Each cycle addresses problem identification, planning,

implementation, and evaluation. Each of these phases in the cycle can be subdivided in a number of different steps.

9.2.1 Problem identification

Monitoring: collection of data and information on land-based activities and their impact on the coastal and marine environment. As the iterative ICZM cycle goes back to problem identification, monitoring results in data/information that can be used either for major adjustments or for fine-tuning of country programs.
Assessment: the process of compiling, integrating and analyzing information including economic, social and institutional information, emanating from monitoring and inventory activities.

9.2.2 Planning

Regulatory Framework: Planning is an integral part of the ICZM process. The purpose of planning is to produce a framework (or plan) to guide decision makers in the immediate and future allocation of scarce resources (e.g., space, land, capital investments, fish, water) among competing interests (stakeholders). There are regional legal frameworks that provide guidance in controlling land-based activities affecting coastal and marine resources. Additionally, there are also existing ICZM guidelines prepared by various international institutions that can guide the development of national regulatory frameworks.
Identification of needs: needs for support to programme implementation by institutions and agencies, both inside and outside the region. Various kinds of capacity at national, regional, and local levels are needed to successfully carry out national/regional programs using an integrated coastal management approach. Instruction of the main institutions and agencies in the coastal management process in order for them to be equipped in carrying out and harmonizing national and regional activities and programs. Furthermore, training and education components of country programs are essential for the sustainability of implementation.
Identification of opportunities: new and existing socio-economic developments that offer opportunities to forward the implementation of the national programmes (such as tourism, mariculture, harbours, integrated coastal/freshwater management approaches, public/private partnerships, etc). Opportunities that can be used to implement the ICZM need not always be in the form of problems or issues. Management of existing and new developments to prevent future adverse impacts on the coastal and marine resources follows the precautionary principle advocated in the Rio Declaration, one of the guiding principles of ICZM.

9.2.3 Implementation

Implementation, including operation and maintenance (mainly on national level) Management instruments: Regulation/legislation: national and local laws, standards, permits Economic/financial instruments: taxes, subsidies, domestic funding, public/private partnerships. Case Study and description and analysis of models based on initial country implementation of the national programmes provide lessons learned and facilitate the adaptation of effective management instruments and practices.

Structural/operational measures: Infrastructural projects: sewage treatment plants, land-use plans, upgrading of industrial machinery Cleaner production/best practices: Best Available Technology, best management practices for environmental enhancement of industries (waste water reduction, energy efficiency).
Institutional arrangements: the structure of governmental and non-governmental organizations, which provide the institutional mechanisms responsible for and capable of developing and implementing management programmes and plans Capacity building including training workshops, environmental education, conferences, awareness and public participation, information dissemination, consultation with the public, involvement of NGO's.

9.2.4 Evaluation:

The extent to which programme implementation has accomplished its aims and objectives, the lessons learned and the identification of changes required to initiate a new programme. Evaluating accomplishments and shortcomings should be seen as vital feedback for any new monitoring and assessment.

9.3 Capacity Requirements for ICZM

Various kinds of "capacity" at national, regional, and local levels are needed to successfully carry out an integrated coastal management program: (Cicin-Sain and Knecht, 1998)

- *Legal and administrative capacity*: - for example, to designate a coastal zone, to develop and carry out coastal plans, to regulate development in vulnerable zones, and to designate areas of particular concern.

- *Financial capacity*: - adequate financial resources to carry out the planning and implementation of coastal management efforts.

- *Technical capacity*: - information gathering and monitoring of coastal and marine ecosystems and processes, patterns of human use, and the effectiveness of government coastal management programs. Establishment and maintenance of coastal database and information system.

- *Human resources capacity*: -personnel with interdisciplinary training in social sciences (including law and planning), natural and physical sciences, and engineering. Also, public awareness and understanding of the coastal ocean environment and the problems and opportunities it offers

9.4 Information Gathering Tools

Most information requirements will be site specific and related to the country and their specific coastal area problem. Different types of information are also needed at different stages in the ICZM process. Data collected should provide information that allows the understanding of the coastal physical, biological, chemical and geological processes; the

concept of coastal health; ocean and coastal biodiversity; the functions performed by coastal ecosystems; climate variability and climate change; structure and dynamics of coastal settlements and coastal resources management. Table 1 provides a list of the kinds of tools useful in providing information to enable policymaking and decision-making within the ICZM context.

Table 1: Tools used to gather information to support Integrated Coastal Zone Management

Information Needs	**Information Gathering Tools**
Data collection and processing	• available reports, census data, basic statistics and maps, field surveys, core sampling, analog and digital • groundwater basin analyses, hydraulic measurements, stream flow and water quality sampling • Geographic Information Systems (GIS) and video mapping
Economic and demographic projections	• input-output models • econometric models • cohort-fertility analysis • migration models • shift-share analysis • economic base analysis • empirical cost models • travel cost and contingent valuation methods • demand functions and trend analysis
Analysis of natural systems and natural processes	• rainfall-runoff and watershed erosion models • fresh and saline surface water system models (movement of water, sediments and pollutants; water and sediment quality; salt intrusion into river estuaries; wave climate) • models of sub-surface waters groundwater movement, quantity (levels) and quality; salt intrusion into coastal aquifers) • local/regional and long-range models for atmospheric transport and deposition • models of coastal morphology, i.e. shoreline sediment budget and erosion/accretion processes • land subsidence models • models for the assessment of flood risks in relation to natural and man-made flood protection systems • models for the assessment of habitat loss by type and quality of habitat
Analysis of socio-economic activities	• General definition of activity analysis: development of functional relationships between the amount of goods and services produced and costs of production, resources/energy used and residuals produced. • Activity analyses may apply to e.g. agriculture (farms), industries, households, (off-shore) mineral extraction, navigation and fisheries operations. • Sophisticated tools include: sampling of the engineering- economic response surface [interface?] and linear or mixed- integer programming.
Assessment of ecological impacts	• cause-effect relationships

	• eutrophication models • primary production and food-web models • bio-accumulation models • habitat approaches
Assessment of socio-economic impacts	• activity models • cost models • (flood) damage models • historical records • (regional) input-output models • survey tools
Evaluation of strategies	• cost-benefit analysis • trade-off analysis • multi-criteria analysis

Source: www.netcoast.nl

9.5 Coastal Management Techniques

Within the ICZM context it is very likely that coastal management will continue under the aegis of the sectoral agencies (e.g. fisheries, land use, tourism, agriculture) with the ICZM programme performing the function of coordination, harmonization, resolution conflict, integration of coastal policies, filling gaps in management, and monitoring and assessment of performance. A number of tools and techniques already exist and are available for implementation within an integrated costal zone management framework. Several of the more frequently used management techniques include:

- *Zonation:* - the coastal area is divided into geographical zones for management purposes. The zone an be determined based on distances, height above sea level, degree of risk to storm surges
- *Set-Back Lines and Exclusionary Zones*: -Lone along the shore line beyond which construction of building are prohibited, usually to keep structure out of active and areas where coastal erosion can cause damage or where the are may be hazardous or sensitive.
- *Protected Areas:* - Areas of land or water that have been specially designated to protect some aspect of flora, fauna, habitat or ecosystem, usually for the protection of rare and endangered species.
- *Special Area Planning:* -Where it is important to plan and manage an area as an entire unit.
- *Acquisition, Easement, and Development Rights:* - Method through which the government is able to control the use of particular pieces of coastal land through purchase.
- *Coastal Permits:* - Law enacted that requires anyone who wishes to undertake an activity in the coastal zone to obtain a permit from the appropriate agency.

10 EXISTING REGIONAL INITIATIVES

10.1 Barbados

Barbados Coastal Conservation Programme underwent a significant evolution towards a more integrated approach between 1991 and 1998, broadening its shoreline dynamics

focus to include land use and economic development planning, indirect environmental impacts, community participation in resource management and legal institutional strengthening. This change of focus was as a result of the growing awareness of the problems of poor coastal water quality from urban, agricultural and industrial sources and the lack of wastewater treatment systems. The new, more integrated programme combines multidisciplinary research and coastal engineering with institutional and legal mechanisms for coastal development control and the preparation of a national coastal zone management plan. The Barbados Coastal Zone Management Act, which was passed in December 1998, provides the legal basis for one of the first national coastal plans in the Caribbean (Lemay, 1998).

10.2 Jamaica

Jamaica has a history of the use of and dependence on the ocean and coastal resources that range form the diverse living ecosystems such as the coral reefs, mangroves and seagrass beds to the non- living resources such as sand. Industries have historically grown around coastal centers and today more than half of the population lives in coastal areas. Over the years Jamaica's ocean and coastal resources have been diminished and degraded and the need was recognized for their enhancement for long term sustainability.

The Council on Ocean and Coastal Zone Management was established in 1998, with the mandate that included definition of national policy with respect to Jamaica's coastal zone. The Council identified the need for rationalization of the national policy on the management of the ocean and coastal resources. The draft policy is present in the document 'Towards Developing a National Policy on Ocean and Coastal Zone Management" prepared in 2001. In this document five policy goals are identified and include the promotion of sustainable development, conservation of ocean and coastal resources and ecosystems, baseline data collection and research, utilizing the role of science and traditional knowledge and providing the conditions for governance required for effective ICZM. A range of strategies is put forward for achieving the policy goals and responsible agencies and institutions identified with specific actions required to meet these policy objectives. The institutional and legal framework for policy implementation is outlined as well as that of the role of the Council in this process. The Council in its present form, as a high level, multidisciplinary and inter-agency advisory body, overseees the activities of the management of the ocean and coastal resources. The document proposes the establishment of and permanent implementing body, with the legal mandate, along with the funding and technical expertise, to implement the policy (Ministry of Foreign Affairs, 2001).

10.3 St Lucia

The Soufriere coastal region of St. Lucia has traditionally supported agriculture and fishing activities to the extent that it was once described as "the breadbasket of the St Lucia". The emergence of land-based tourism has facilitated the development of the road network, which has in turn stimulated the expansion of the number of hotels and restaurants. In addition to the Pitons, Sulphur Springs, tropical forest and waterfall the marine-based activities (yachters, scuba divers and snorkellers) have added significantly

to the touristic appeal of the Soufriere region. The rapid development of tourism has spawned conflict between the various users, with the feeling amongst the townspeople that they were not benefiting from the tourism-related business generated by the town.

Following a number of laudable initiatives by the Government and civic-minded businesspersons to facilitate more direct participation of the townspeople in the management of Soufriere, the Soufriere Marine Management Area (SMMA) was established. The "Agreement" initially represented an interim management instrument for an 11 km zone, comprised of marine reserves, fishing priority areas, multiple use areas, recreational areas and yacht mooring sites. The SMMA was ratified in 1995 giving the organization semi-autonomous status, financed through user fees. The process of decentralization and power-sharing provided through this process has a number of weaknesses but has created, at the community level, a greater awareness and appreciation for the value and potential of Soufriere's resources as well as the potential for participation and collaborative management. (Springer, 1998).

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