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The coastal environment of Jamaica: problems, protection, management

Vivette P. Grant

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WORLD MARITIME UNIVERSITY
MALMOE, SWEDEN

THE COASTAL ENVIRONMENT OF JAMAICA: PROBLEMS; PROTECTION; MANAGEMENT.

By:
Vivette P. Grant
JAMAICA

A Dissertation submitted to the World Maritime University in partial fulfilment of the requirements for the award of the:
Degree of Master of Science in
GENERAL MARITIME ADMINISTRATION

Year of Graduation 1992
I certify that all material in this dissertation which is not my own work has been identified and that no material is included for which a degree has been previously conferred upon me.

The contents of this dissertation reflect my personal views and are not necessarily endorsed by the University.

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THE COASTAL ENVIRONMENT OF JAMAICA: PROBLEMS: PROTECTION: MANAGEMENT.
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VPG.
DEDICATION.

I would like to use this forum to pay a special tribute to my dedicated, understanding and supportive husband, George, who sacrificed two years of his career for two main reasons: Firstly, to end my nightmare of separation from my two year old daughter and; secondly, to afford Georgette the opportunity of spending the formative years with both parents.

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Vivette.
Abstract.

The rapid increase in population and the necessary demands for economic development have had and continue to have great impacts on the limited natural resources of Jamaica. Consequently, renewable resources such as marine fisheries and coastal habitats have been virtually depleted: some to the brink of extinction, such as manatees and turtles which were historically regarded as valuable species.

This is evident in the current patterns of development within the coastal zone of Jamaica which continues to result in the abuse and misuse of the coastal environment as well as the resource base. Important functions of critical habitats such as the retention of soil and water by the watershed have been impaired.

Wade (1987) contends that "industrial, domestic and agricultural pollution are prevalent and in some areas are reaching intolerable levels".

Based on Wade's assessment of the environmental consequences which ensue because of the apparent lack of concern by the Authorities for the preservation of the environment when development strategies are formulated: the Jamaican coastal zone will continue to be affected negatively in the foreseeable future.
Presently, some of these effects are made manifest revealing some of the worst areas of degradation and human impacts. These are outlined as follows:

1) Soil erosion due to deforestation and poor soil conservation methods.

2) Reduced water quality resulting from pollution.

3) Destruction of coastal and marine habitats due to pollution especially from sewage and land run-offs.

4) Beach denudation resulting from escalating demands for tourist resort areas.

The coastal zone which supports commerce, industry, transportation, fishery, settlements, recreation and aesthetics needs is faced with the challenge of maintaining a balance in these areas and at the same time preserving the environment. This seems to be an insurmountable problem. For example, tourism which continues to be a multi-million dollar industry is located in the prime areas of the zone. It is well known that tourism related activities impact negatively on the zone, as has been the case elsewhere in the Caribbean region.

Quite often the different resources demand the same scarce or fragile piece of land. Owing to the fact that the resources of the zone are finite, it is impossible to meet the needs of all the conflicting demands for use and activities within this limited space.
Therefore, the need for an integrated coastal zone management strategy is one of the most urgent tasks facing the Jamaican society.

There is a plethora of environmental legislations and institutional arrangements governing coastal zone management in Jamaica. However, in the absence of an islandwide coastal zone management act these organizations are given a free hand to do whatever they please.

There is also a great deal of overlapping between the various designations, their extent in the zone and the protection each offers; thus it is urgent to rationalize these laws and create a lead agency to harmonize the activities of the zone in order to reverse the impending degradation.

It cannot be over emphasized therefore, that solutions to the problems of erosion, pollution, destruction of sensitive areas, sewage disposal and solid waste require the implementation of an integrated coastal zone management strategy.

It is against this background that an attempt is made to identify and evaluate the problems associated with development within the coastal zone and subsequently present guidelines relative to addressing remedial action.
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Introduction.

The earlier perception that nature's gifts are infinitely inexhaustible, has proven to be a myth. This philosophical misconception of the effects of man's actions on the environment has encouraged his pursuit and exploitation of the environment without personal restraint or without consideration for the present and future consequences. Today, there is overriding evidence to prove that this is not so; therefore, a new dimension surfaces.

The potent nature of developmental activities in the coastal zone of Jamaica are seen in the proliferation of erosion, flooding, beach denudation, pollution and the destruction the fragile coastal and marine resources. Consequently, the need to address and maintain a viable coastal zone for ourselves and succeeding generations is urgent.

Invariably, the strategy of development pursued in Jamaica over the years was prescriptive. The development trust in the island was conceived in terms of structural adjustment for economic development without the realization that development and environment are inextricably intertwined. The priorities of the past and previous governments focused on promoting those sectors and sub-sectors which will earn foreign exchange in order to pay national debt. There was no clear cut island wide coastal zone management policy.
The lack of the government's commitment to the environment was manifested in the low priority accorded to these matters coupled with low budgetary allocation to the relevant agencies. Another drawback in the quest towards development was the inordinate faith that the leaders placed in the power of ideology to provide them with the key to development. The object was to gain political mileage through cheap popularity. No one wanted to "bell the cat"; therefore, laws which had no "teeth" were promulogated under the guise of management.

While acknowledging that a minority within the government perceived the need for integrated coastal zone management, their views were not clearly shared. Thus coastal zone management was put on the back burner.

Future economic trends indicate that the 1990s will bring mounting pressures on the coastal and marine environments of Jamaica. The demographic indicators of 1994 record an increase of 3.2% in the 15-64 age group of the population. From all appearance pressures for development and expanded use of the coastal zone will accelerate as the government attempts to create new and additional employment opportunities.

Quite elaborate strategies have been outlined in the 1992-1995 Five Year Development Plan relative to addressing environmental degradation. These include among others: The National Conservation Strategy which has been termed the first step in the development of a structured framework for environmental management. Additionally, there is the National Forestry Action Plan.
Two major pieces of legislations are currently being drafted, namely: The Natural Resources Conservation Authorities Act and the Natural Resources Conservation Act. The latter Act is directed towards the consolidation and reformation of the laws relating to the environment.

Given the economic background of the Country, it is doubtful if these ambitious policies will materialize. If the resources are to be sustainable, the many pieces of legislations need to be integrated into the overall development framework of the Country. There must be a new trust: a new approach to coastal zone management. From the level of the government, there must be the willingness to put in place a system to ensure that violators are prosecuted. This will require fundamental adjustments in our value systems, our institutions and our legal regimes. Furthermore, it will require a certain level of commitment and participation of all corporate entities in Jamaica.

This is not an easy feat to accomplish but the sooner this is done the better it will be for the present and future generations: or as Dr. Barry Wade alluded to "Jamaica the land of wood and water will fast become the land of environmental slaughter".

It is against this stated background and in the light of the current initiatives toward coastal zone management in Jamaica that the writer has decided to address the issue.
The objective of this dissertation is fourfold.

1. To identify and analyze the problems associated with development within the coastal zone of Jamaica and their devastating impacts on the fragile coastal ecosystem.

2. To discuss and analyze the various uses of the coast as they affect the zone and as they relate to each other.

3. To describe and analyze the existing institutional framework and legislations as they affect the resource base and areas of coastal concern.

4. To establish/propose a policy framework which outlines the methodology to be applied as regards development of an integrated coastal zone management for Jamaica.

An attempt will also be made to elucidate the issue of the economic importance of the coastal zone resources and the need for protection and management.

The common structural plan of the paper is outlined below. Part one of the dissertation is contextual. It describes the physical, cultural and economic configurations of Jamaica.

Chapter two discusses and analyzes the various uses of the coast as they affect the zone and as they relate to each other. There is the need to balance the overwhelming quest for economic development while simultaneously managing and conserving the resources. This chapter therefore, sets the stage or otherwise provides the base for evaluating development within the zone and its practical approach to sustainable development.
Primarily, chapter three identifies and analyses the problems associated with development within the zone and their devastating effects on the fragile coastal ecosystem.

Chapter four addresses the question of the relevance of coastal zone management for Jamaica. Some general concepts of coastal zone management are first presented followed by a discussion of the suitability of one of these concepts for Jamaica. Where practicable management approaches of other countries are used to demonstrate applicability.

Chapter five addresses the prospects for coastal zone management for Jamaica. This includes a review of the national policies and development plans, the existing legislations and the agencies and institutional arrangements responsible for coastal zone management that have resulted in the absence of an overall coastal zone management policy.

The final chapter takes the form of an illustrated manual outlining the methodological approach to be taken in the development of an integrated coastal zone management system in Jamaica.
Chapter One: Context.

Physical, Demographic And Economic Context.

Geography.

Jamaica in A Regional Context.

1:1 The Caribbean: Two Definitions.

Some people refer to the Caribbean in terms of the Caribbean archipelago. This definition is sociological in the sense that the countries and territories that fall within it, share to some degree, a series of common experiences. The islands of the greater West Indies, the mainland states of Guyana, Belize, Surinam and French Guyana fall within this definition. The coastal settlements of central and northern South America are also included.

These countries except those of Latin America have several commonalities which include among others the following:

* They share long histories of colonialism.

* They have large numbers of Africans in their populations and have experienced the dominance of slavery and sugar plantations in their early economies.

* These societies are overwhelmingly immigrant in character.
Definition Two.

The second definition of the Caribbean basin is geo-political in scope, in the sense that the countries and territories identified are the targets of diplomatic and strategic efforts. The areas of the Caribbean archipelago plus Mexico the five Central American republics, Panama, Columbia and Venezuela comprise the basin. (see figure one).

Source: Caribbean Data Atlas, June
This definition is geographically coterminous with an environmentalists definition. The geo-political definition gets its unity from mutual, though often antagonistic concern of what is happening in the area.

The Panama Canal, the Yucatan channel between Mexico and Cuba the Windward Passage between Cuba and Haiti. The Mona Passage between the Dominican Republic and Puerto Rico, the Passages between the various Leeward and Windward Islands are the lanes that control shipping in the region and therefore they determine the free coming and going of maritime commerce including oil. (see figure two).

Figure 2. Major and minor sea lanes through the Caribbean with prominent ports of entry and airports. Source: Caribbean Data Atlas/UCN.
It is considered essentially prudent at this outset to present to the reader an understanding of the various definitions of the Caribbean owing to the fact that, certain problems of the region such as pollution and waste disposal are currently being addressed in a regional context under the United Nations Regional Seas Programme. It should also be borne in mind that a regional approach to many of the existing problems is a step in the right direction.

1:2. Jamaica Within The Region.

Jamaica is the third largest island within the Caribbean sea. It is situated approximately 90 miles (145km) south of Cuba and 100 miles (161km) west of Haiti. (see figure three.)
1:3. Jamaica: The Island.

Jamaica is a mountainous island approximately 235km (150 miles long) by 80km (50 miles) at its widest point, with its major axis oriented ESE/WNW.

The island is divided into three Counties: Cornwall, Middlesex, and Surrey. It is further subdivided into fourteen parishes, the largest of which is St. Catherine in the southern coastal plain. (See figure four).

Figure Four.

JAMAICA
COUNTIES, PARISHES, MAJOR TOWNS AND CITIES
Each parish has a town capital which is the center of local government and administration. Kingston which is situated next to the harbour of Port Royal is the capital city. Montego Bay, the other city, is located on the island's north western coast in the leading tourist resort area. In addition to these two cities, there are two main town capitals: Ocho Rios and Spanish Town. The former is a fast emerging tourist destination accounting for 45% of cruise shipping. This is due to its two deep water (berth/pier). The latter is the oldest town and was at one time the capital of Jamaica.


Jamaica has a tropical marine climate with winter mean temperatures of 20-27 degrees centigrade and summer temperature of 30-32 degrees centigrade along the north coast. The prevailing winds are from the east usually east north east (ENE) on the north coast and east south east (ESE) along the south coast. 1.

Rainfall. Seasonal changes.

Jamaica's average annual rainfall is approximately 77 inches (ins) much of the rainfall results from the north easterly trade winds. Rainfall on the north eastern slopes of the Blue mountain is generally 3,000, to 5,000mm/year whereas, in the south coastal plains of St. Catherine and Clarendon it is generally less than 1500mm/year. 2.

The rainy season occurs in the months of May, June and October specifically and is associated with tropical storms
and hurricanes, flood producing rainfall of high intensity and magnitude. The dry season which is the coolest, lasts from December to March with an average temperature of 75-83 degrees centigrade. (see figure five).

Figure Five.

RAINFALL DISTRIBUTION OVER JAMAICA - 30 YEAR MEAN (1931-1960)

Source: Evans (1173), Jamaica Meteorological Division
Natural Hazards.

Jamaica is susceptible to the natural hazards of hurricanes, floods, earthquakes and land slippage. The coastal areas are more vulnerable to flooding caused by hurricane induced storm surges.

(1) Hurricane.
The island was the recipient of a direct hurricane hit by "Gilbert" on September 12, 1986. This resulted in an excessive loss of lives and properties. The greatest effects were felt in the destruction of the north coast reefs particularly in the eastern section of the island.

The problem of erosion at Johnson Town town (St.Ann) which started as a result of sand removal resulted in the total reclamation of the land and main road by the sea to the extent that residents had to be evacuated. Further acts of devastation were damages to port infrastructure in excess of J$6m. (Daily Gleaner, September, 1988).

This hurricane demonstrated the potential impact of natural hazards on the coastal and marine environment and the need for greater planning, preparation and management of developments within the coastal zone.

(2) Earthquakes.

Jamaica lies within one of the world's seismic risk areas. History records two major earthquakes: the 1692 and 1907 respectively which seriously impacted the island. The former completely destroyed Port Royal which was occupied
at the time by the notorious Spanish Buccaneers.

Occasionally, the island experiences tremors, the most recent of which were felt directly after Hurricane "Gilbert" in 1988. Low intensity earthquakes also occurs along the north coast where most of the tourist resorts are located.

This being the case, there is the need for greater planning and monitoring of settlements especially in flood plains and poor soil areas.
There is as yet no universal agreement amongst coastal Geomorphologists regarding the exact definition or delimitation of the coastal zone even though all recognize the existence of such a zone. Most authorities however, understand the zone to extend from the low water mark to the furthest limits inland of marine influence.

In many countries, the concept takes on different connotations and forms. Different definitions are used by different individuals or groups involved with coastal resource use or planning. These definitions reflect differences in focus of the endeavour or objectives of the group concerned. In this context, E. Seabrook Hull perceives "that to much and to many the coastal zone remains a view point".

In the light of the different perceptions regarding the coastal zone, the first problem encountered in this study is to provide an appropriate definition of this concept. This problem extends to words and phrases that are preceded by the word coastal and serves to indicate the problems of its delineation. Is the coastal zone synonymous with the coastal area? Are the coastal plain and the coast line the embodiment of the coastal zone? Is the coastal zone a line or an historic spot? Should one differentiate between open coastline and the estuaries, creeks, inlets and harbours? Should one narrow the definition to the land water interface or widen it to embrace a coastal zone. How does one define the spatial and temporal limits or boundaries under consideration? For example, how far inland should this boundary be established? It is therefore evident that for managerial purposes of such a zone many complexities can arise. These are some of the
pertinent questions which need to be taken into consideration in any definition of a country's coastal zone.

Various definitions have been elaborated with regard to the coastal zone. Accordingly, it is necessary to discuss some of these.

Sorensen, et al, perceive the coastal zone as a transition between land and sea which represents two environmental domains. 5.

Ketchum, et al, see the zone as the band of dry land and adjacent ocean spaces and water and submerged land in which land, ecology and use directly affect ocean space and vice versa. 6. The transition as advocated by Sorensen is defined functionally, ecologically and geographically by Ketchum.

Functional Definition.

A functional definition relates to the production, consumption and exchange process in the zone.

Ecological Definition.

An ecological definition considers biochemical processes and the interaction with human use.

Geographical Definition.

A geographical definition comprises a landward component which is described as being vague and difficult to delineate and a seaward limit at a point where the effects of human use on the marine ecosystem are just discernable.
On the other hand, Stella Maris Vallejo defines the coastal zone in the following form.

(1) As an area of profound inter-action between the land and sea.

(2) As a transitional zone where structures and processes from both the marine and terrestrial environment converge.

(3) As a finite resource area which provides numerous living and non-living resources but is also the site for the development of a wide spectrum of economic activities sometimes in conflict with each other.

Vallejo is of the view that the definition given by Ketchum is the most complete as it encompasses all the processes involved.

Elaborating further, she recognized the coastal area as, "an integrated system of land and water". From an ecological viewpoint, she feels that the integrated management of both portions of the coast calls for the protection of the biological equilibrium and the protection of the coastal systems that are indispensable to the life of plants and animals.

She likewise noted that the coastal zone is the doorway to the exclusive economic zone which therefore provides the supporting systems for its economic development.

From an administrative perspective, Vallejo pointed out that the coastal areas are formed from the smallest political and administrative units to the national and public domain.
As regards the seaward component of the coastal area, Vallejo noted that different definitions are accorded to this limit some of which might include the exclusive economic zone. However, she noted that an important consideration in this regard would be the boundary criteria applied, which could include an area of two hundred (200) miles regardless if the edge of the continental shelf reaches the 200 mile limit or not. This definition is rather comprehensive and addresses all the aspects to be included in any wholistic management of the coast.

Although the 1982 Law of the Sea Convention has not yet entered into force, the issue of the 200 miles limit has gained the favour of many nations. Therefore, for all intents and purposes it seems to be a reasonable proposal.

Other definitions of the coastal zone are more specific. Since the focus of the study is on Jamaica it is considered useful to highlight some definitions postulated by Jamaicans.

Professor Goodbody, a lecturer at the University of the West Indies delineates the Jamaican coastal zone from "The extent of the island’s shelf to an elevation of thirty (30) meters inland." This is a rather simple and specific definition.

Malcolm Hendry, another Jamaican characterizes the zone by its physical features which include rivers, deltas, alluvial plain, tombolos, raised reefs, salt ponds, sand bars and pits, fringing reefs and cliffs.

In a paper on "THE Status of Environmental Management of Coastal And Wetland Resources In Jamaica", Peter Bacon delineated the coastline as approximately 560 km. and
characterized the zone to include extensive banks such as the Pedro and Morant Bank. The sum total of these two areas is 2560 km. and which in Bacon's opinion comprises the coastal zone of Jamaica.11 (see figure 6).

Source: P. Bacon 1987, Coastal Resources Management Wetlands of Jamaica
Summary.
The foregoing discussion is focused on some of the concepts concerning the coastal zone. While there are no opposing views per say, it is noted that definitions vary between countries and individuals. However, it is important for each country to be able to identify and delineate a coastal zone in order to formulate appropriate management guidelines. For purposes of this study, Ketchum's definition will be adopted. Regarding the Jamaican definitions of the zone, Goodbody's definition of the zone extending out to the island's shelf and up to a landward limit of 30 metres altitude shall be adopted.

1:6. A COASTLINE.

The linear coastline of Jamaica is approximately five hundred and sixty (560) km. (P. Bacon. See figure 7).
The amount of useable shoreline is 45.5% of the entire coastline. The coastline is extremely varied and is described as either straight, indented, raised or irregular. There are however, important distinctions between the north and south coast. The south shore of the coast is characterized by straight cliffs, mangrove, swamps and black sand beaches.

Conversely, the north coast is rugged in the east, fringed by coral reefs along most of the entire length and has several fine white sand beaches which stretch for four miles long (6.4 km) along the west coast of Negril. This area has no shallow marine flat shelves. The sea and beaches are supported by a flat raised plateaux and uplift coral reefs.

1:6.B. THE COASTAL PLAIN.

A narrow coastal plain rings the shoreline for most of its entire length. Goodbody, delineates the coastal plain to comprise an area less than 3.2 km. along most of the north and south coast areas.12.

The plain widens in other areas and reaches its maximum width in the contiguous Liguanea, St. Catherine and Clarendon plains. Further west along the coast are two swamp areas, the Black River Upper Morras and the Great Morras and the Westmoreland Plain on the western end of the island.

Due to the ruggedness of the interior highlands it is in this area that the greatest population concentration occurs and the major developments take place. The prime agricultural lands are also located in the interior valleys and on the coastal plains.
1:6.C MARINE AREAS.

(A) THE TWELVE MILES TERRITORIAL SEA. (EXCLUSIVE ECONOMIC ZONE) (EEZ).

In accordance with the United Nations Law of the Sea Convention (UNCLOS 3) a state may establish a twelve mile territorial sea within which it may exercise sovereignty.

Additionally, a state may establish a twenty four (24) miles contiguous zone within which it may exercise administrative powers relating to law enforcement.

(B) THE EXCLUSIVE ECONOMIC ZONE, (EEZ)

The Third United Nations Law of the Sea Convention (UNCLOS 3) also accords a sovereign state an EEZ whereby it may exercise rights over the living and non-living resources.

(C) JAMAICA AND UNCLOS 3.

The Law of the Sea Convention was signed at Montego Bay, Jamaica in December 1982. Jamaica is a signatory to the Convention and is also poised for the Law of the Sea headquarters.

(D) MARITIME BOUNDARY.

As a signatory to the Convention, Jamaica has established a maritime boundary which extends to a twelve mile territorial sea. The outer limits of the territorial water is twelve miles from the island.

The island has also established an exclusive economic zone. The establishment of this zone confers the right on Jamaica to secure "all shoals and banks of long usage that are
beyond the territorial sea. Additionally, it gives the Country the power to enforce its fishing regulations within a larger area, thus restricting foreign fishing to the surplus of its allowable catch.

It is not the intent at this time to elaborate on the Convention in detail but it is felt that any discussion of the EEZ should of necessity briefly mention UNCLOS 3. While the Convention accords rights to states the extended jurisdiction creates challenges for protection and management of the coast. Accordingly, the subject will be revisited later in the study.

Summary.
The ensuing discussion established that there are many connotations to the coastal zone. The point was also brought out that definitions vary between countries but that for management purposes such a zone should be identified and delineated.
A resource is defined as a means or aid or support. The implication is that anything which lends support to life or an activity is a resource. It is important to note that this definition is not specifically related to human beings but includes plants, and aquatic life which depend on a constant supply of resources to supply their physical needs. In the light of this definition how does one define the coastal resources?

According to Professor Ivan Goodbody, coastal resources are defined as resources located on or within the island’s (Jamaica) continental shelf (<200m) and under the influence of the sea along the landward margin and coastal plain. What therefore, are the resources of the coastal zone of Jamaica?

The range of resources in the coastal zone of Jamaica can be described as extensive and complex. For further analysis of these resources it is useful to classify them.
1:7.C CLASSIFICATION OF THE COASTAL RESOURCES.

The coastal resources may be classified under the following headings:

* Living or Biological Resources. (Renewable.)

* Non Living resources. (Non Renewable.).

* Cultural and Aesthetic Resources.

Living resources will be further classified into:

* Coastal Habitats.

* Fisheries Resources.

1:7.D. COASTAL HABITATS.

The habitats are briefly described here and the destructive impacts of development on these eco-systems are discussed in chapter two.

(A) MANGROVES.

"Mangroves grow along the shore and trap nutrients by filtering rain water from land. The intricate root system of the mangroves helps to catch the soil and other nutrients and acts as a protective nursery for fish and shell fish".

Mangroves are defined as salt tolerant woody flowering plants which occur in the intertidal zone or low lying coastal areas. (see figure 8).
Mangroves and herbaceous swamps cover approximately 30% of Jamaica’s coastline.

The following four genera of mangroves are identified in the Caribbean:

(1) *Rhizophora mangle* (red mangrove)

(2) *Lagunculana racemosa* (white mangrove)

(3) *Avicennia germinans* and *cono carpus erectus* (black mangroves) and;

(4) The swamp fern (*Acrosichum aureum*)

The red mangroves (plops) is said to be the most tolerant to exposure in the Caribbean. They are fast growing trees which drop large quantities of litter. The dense thicket of prop roots trap suspended sediment and falling leaves which decay to form a rich organic mud. Nutrients are transported through the roots and recycled through the trees. This specie of mangrove lines most of the coast and riverine forests in Jamaica.

The mangrove eco-system performs a number of vital functions some of which will be highlighted at this point.

(1) Mangroves sustain and are the habitats of many animals. Their roots are home to sponges, crested worms, crustaceans and mollusks as well as a great variety of algae. The space between their trunks provide shelter for numerous crabs and insects. A variety of birds nest in their foliage. Also a large number of fish and reptiles species spend part or the whole of their life cycles in canals and channels which run through the mangroves.
(2) Mangroves are able to dissipate waves and tidal energy due to their dense root network. This allows the decomposition of mud and silt leading to sediment build up while reducing the quantity which enters the coastal waters. Over time the mangrove can actually create land through this process. The cushioning of wave energy also serves to protect the coastline from excessive erosion.

(3) Owing to their particular characteristic of being able to extract nutrients from the water, mangroves are able to minimize eutrophication. Additionally, they are able to detoxify and immobilize some common pollutants.

(4) Consequent on their productivity, nursery and habit function mangroves serve as the basis for many subsistence and commercial coastal fisheries.

Mangrove eco-system is said to be particularly sensitive to availability of water and nutrients and the stability of the coastline which makes them extremely fragile. Having highlighted the properties of mangroves and the useful purpose that they serve one realizes why the destruction of the mangrove eco-system needs to be curtailed. Chapter two will expand on the uses of mangroves in Jamaica and the impacts of development on their eco-system.
Seagrass beds are an important food source and a habitat for many fish species but little have been done to protect them. These are benthic seed producing marine plants which occur in shallow near shore waters. 11. (Montego Bay Marine Park Doc.).

Sea grass beds are extensive on sheltered sandy sea floors around Jamaica. The turtle grass, Thalassia Testudium is the turtle grass is the most important plant and forms dense carpets in which a lawn of strap-shaped leaves spring from a compact mat of creeping stems and roots. It is as productive as sugar cane; creating, for example, more than 2 kg/m/year of organic matter in Kingston Harbour. (Greenaway, 1974).

**IMPORTANCE OF THE SEA GRASS BED.**

Sea grass beds are important to the marine area for the following reasons:

1. They are a primary food source for several marine species such as the sea turtles, fishes and the sea urchins.

2. Sea grass meadows are also significant producers of carbon materials.

3. They help in consolidating bottom topography absorbing the energy of waves of tidal currents and removing sediments from the water. Therefore, they add significantly to the water quality of the island.

4. Perhaps the most important function of sea grass meadows is that they form a habitat for many fish species, including many valuable commercial species, especially in their nursery stage.
Sea grass beds are most sensitive to excessive sediments as well as to high turbidity levels. They are perhaps most sensitive to dredging operations.

To some extent managing seagrasses is an important part of managing the fisheries resources. This fact has not been grasped by the populace of Jamaica and the Caribbean as a whole. Consequently, there has been little inclination to protect sea grass meadows. This is particularly unfortunate because as indicated earlier seagrass beds are delicate and are easily disrupted by human impacts such as pollution. Therefore, the need to manage sea grass meadows is urgent.

(C) CORAL REEFS.

DEFINITION.

A reef is a mass of consolidated calcium carbonate which has been built up over time by successive growth of reef building. (Montego Bay Marine Park Doc) 12.

Coral reefs occur all around Jamaica and are well developed on the north coast. (Montego Bay DOC) (see figure 9)
FUNCTIONS OF CORAL REEFS.

(1) Coral reefs provide habitat and shelter for a wide range of mobile and sessile organisms, such as fish, lobsters and crabs. They also serve as nursery and grow out areas for the above organisms. In addition, they are feeding grounds for fish, turtles and sea urchins.

(2) Apart from their function as habitats, coral reefs serve a number of physical functions. They act as breakwater and protect bays, coasts, beaches and sea grass beds from wave action. They provide natural storm protection and are contributors of beach sand material.

(3) Coral reefs also possess aesthetic value. This particular feature makes them very attractive especially to the tourists who visit our island from time to time. The reefs produce an ideal environment for the sport fishermen and divers who continue to harvest the corals to sell to the regular visitors to the island. Like the other habitats, coral reefs around the island have been significantly impacted by human activities due to poor management strategies. These destructive impacts are elaborated upon later in this paper.

(D) MUD BOTTOMS.

These originate from seasonal run off of fresh water which causes sediment and organic materials to be deposited in coastal lagoons. Such areas are highly productive and support substantial shrimp and ground fisheries.
There are fresh water swamps at diverse altitudes throughout the island but the major wetlands are close to sea level. (Procter, 1986). There are a significant number of wetlands in Jamaica. The two most notable however, are the Negril and Black River. The latter is divided into the upper (18km) and the lower morass (43km). (See figure 10).

Source: P. Bacon 1987, Coastal Resources Area Management Wetlands of Jamaica
Peter Bacon noted that wetlands once occupied more than 20,000ha (approx. 50,000 acres) of coastal land development in the island but that these are being rapidly lost to real estate, agricultural and tourist development. The remaining areas however still are considered as valuable ecologic and economic systems.

**IMPORTANCE OF WETLANDS.**

(1) Wetlands support aquatic food chains leading to commercial species. They produce a range of food organisms such as fish, crabs and oysters.

(2) Wetlands are also of economic value in that they produce timber, charcoal and handicraft material.

(3) The Negril and Black River Morass contain important peat resources. The search for a cheaper source of energy by the Jamaican government in the 1980s resulted in the discovery of deposit of peat in the above named wetlands. The discovery of peat can be considered the turning point in the current degradation of the wetlands.

(4) Wetlands are also important in coastal protection, flood control, as wildlife habitat and as potential recreational areas.

In view of the importance of this eco-system they should be managed as part of the nation's natural resource base.
BEACHES.

DEFINITION.

A beach consist of unconsolidated sediment transported to shore and moulded into characteristic forms by wave generated water motion. (Sneaker 1984)

There are approximately 105 beaches in Jamaica. These may be composed of "white coral sand", shells, gravel or black sand. Beaches occur on parts of most of the exposed coastline of the island.

In the Old Harbour Bay there numerous shell beaches. The western end of the island Negril in particular has seven miles of white sand beaches. On the North Coast in the Montego Bay and St Ann's region there are several white sand beaches. These areas are particularly attractive to tourist because of their aesthetically pleasing natural setting and the fact that they are well equipped to facilitate swimming, pleasure boating and other water sport related activities.

Beaches perform among other things the following functions:

1) They provide shelter for habitats such as coastal wetlands and mangroves.

2) They protect land, lagoons and harbours.

3) They serve as nestling grounds for sea turtles.

4) They act as a centre for social amenity, residential and tourist development.

5) They provide a base for fisheries development.
(6) They serve as a source for mineral sands.

Jamaica is internationally renowned for its lovely white sand beaches, amenable climate and beautiful landscape. The most beautiful beaches are scattered along the north and south coast of the island. This particular feature attracts millions of tourists to the island each year to enjoy the three "S" sea, sand and sunshine.

As the island increases its tourism campaign and develops its hotels, millions are drawn to the island. Despite the economic importance of beaches, they suffer from degradation resulting from human impacts such as the following:

(a) Beachfront construction, especially resort hotels.

(b) Sand mining.

(c) Coastal dredging

(d) Littering

(e) Destruction of the vegetation as a result of trail erosion.

It is necessary for the government planners to address these problems if Jamaica is to retain the amenity value of its beaches. To address them properly will require the revision of outdated legislation and the integration of regulatory and enforcement procedures.
The fishery of Jamaica is primarily artisanal in nature. It is conducted by fishermen operating from canoes. Approximately 95% of these fishermen operate on the islands continental shelf and its associated banks. (see figure 11)

<table>
<thead>
<tr>
<th>RESOURCE</th>
<th>TYPE OF FISHERY</th>
<th>LOCATION</th>
<th>TYPE OF RESOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FISH</td>
<td>CAPTURE</td>
<td>NEARSHORE (Island Shelf)</td>
<td>DEMERSAL (Coral Reef Fishes: Numerous Sp.)</td>
</tr>
<tr>
<td>SHELLFISH</td>
<td>CAPTURE</td>
<td>INSHORE</td>
<td>NEAR BANKS</td>
</tr>
<tr>
<td>AQUACULTURE</td>
<td>INSHORE -- LAGOON &amp; ESTUARINE</td>
<td>HOLLUSCS (Oysters)</td>
<td></td>
</tr>
<tr>
<td>AQUACULTURE</td>
<td>INSHORE -- (As above)</td>
<td>INCIDENTAL SHRIMP (Penaeidae)</td>
<td>LOBSTERS, CONCH, SOME CRABS</td>
</tr>
<tr>
<td>FISH</td>
<td>CAPTURE</td>
<td>OFFSHORE -- (As above)</td>
<td>TILAPIA, MULLET</td>
</tr>
<tr>
<td>SHELLFISH</td>
<td>AQUACULTURE</td>
<td>FISH FARMS (As above)</td>
<td>GIANT FRESHWATER PRAWN (Macrobrachium Sp.)</td>
</tr>
<tr>
<td>AQUACULTURE</td>
<td>FISH FARMS</td>
<td>PUBLIC</td>
<td>TILAPIA, CARP</td>
</tr>
<tr>
<td>AQUACULTURE</td>
<td>FISH FARMS</td>
<td>PRIVATE</td>
<td>SHRIMP (Several Sp.)</td>
</tr>
</tbody>
</table>

Source: Jamaica Country Environmental Profile
September 1987
The marine fishery is divided into two main regions:

(1) The inshore fishery.

(2) Offshore.

Inshore Fisheries.

This includes fisheries carried out on the islands shelf areas (the near shore fisheries) and in some areas not exceeding 64km from the mainland. These regions support the bulk of fisheries activity.

Offshore Fisheries.

This type of activity encompasses operations of Jamaica's two largest offshore fisheries areas, the Morant and Pedro Keys. The former area (259 square km) contains three small cays supporting approximately 100 fishermen. The latter supports a substantial fisheries carried out by at least 400 fishermen based on two of three small cays situated at the south eastern border of the bank.

Commercial Species.

Commercially harvested species comprise demersals, coral reef species, including fin and shell fish and free swimming pelagic species of finfish.
Demersal Fisheries.

More than 200 species of coral reef fish are landed and marketed. Of this number 70% of the species comprise more than 80% by weight of fish caught in traps. These species include fish from groups such as the groupers, snappers, grunts, goat fish and parrot fish.

Pelagic.

These comprise far ranging ocean species such as the yellow fin tuna, dolphin fish and various sharks and coastal dwellings or inshore species such as the herrings, anchovies, mullets and jacks. Oceanic species are taken by line fishing while coastal species are taken mainly by gill and seine nets.

The fisheries resource in Jamaica is rapidly being depleted. The problem is that fish are not being caught in a sustainable way. This is a serious problem owing to the fact that fish is an important source of protein to the population at large. It is therefore necessary to implement conservation and management measure to rebuild the stock.
1:8 Non Living Resources.

(1) Petroleum Resources (oil and gas)

Nature has not endowed Jamaica with any substantial deposits of oil and gas resources. Consequently, the country imports nearly all of it's petroleum products. Several attempts have however, been made in the past relative to offshore exploration but these have proven futile. A recent development is the completion of two dry holes on the Pedro Banks and the Petroleum Corporation of Jamaica is re-evaluating both offshore and onshore exploration work.

(2) Sand and Gravel.

These materials occur in beaches throughout the entire Caribbean region. Sand and gravel are mainly used in the construction industry. A thriving sand mining activity is carried out on some of the major beaches in Jamaica. Indiscriminate beach and offshore mining are contributors to coastal erosion.

(3) Limestone.

This is used in the production of cement, coarse building aggregate, fertilizers and in the chemical industry. Coral and algal reef environment, shell banks and deposits by direct precipitation of calcium carbonate from sea water are the major sources of limestone.
1:9 Cultural and Aesthetic Resources.

These are not necessarily quantifiable or capable of being costed. However, they have some value to the society. Just as important is the fact that they can often be adversely affected by human activity. For example, clear deep blue pristine sea water has therapeutic values. Similarly, the beauty of the cliffs, plains, valleys, beaches and mountains may be admired by all. Leisure value of beaches is equally enjoyed and appreciated by many. This is one of the main reasons for the large influx of tourists in the island.

The intrinsic value of these resources, for example, the flora and fauna and the fringing reefs may be tapped by tourism. Conversely, the may be destroyed by tourism. These intrinsic values can become a cost factor in the long run if proper management control practices are not in place to ensure the preservation of the resources.

Summary.

The coastal and marine resources of Jamaica are important in economic, ecological, nutritional, spiritual and educational as well as culturally. The problem of resource abuse and degradation is very real, thus underscoring the need for properly planned development and exploitation. Unfortunately, there is all too often a lack of information about the extent of the resources or a lack of proper management mechanisms. If these resources are to be used sustainably a concerted effort must be made to address the problem of ignorance, indeterminate policy and the regulatory and management mechanisms.
1: 10. **Socio-Economic Factors.**

(a) **Government.**

Jamaica was governed by Great Britain until 1962 when it gained full independence. It is now a member of the British Commonwealth of nations with a Governor General representing the Queen. The political system is based on the Westminster model but the country has its own constitution. The constitution provides for a democratic form of government with a House of Representative elected every five years under universal adult suffrage. There are two major political parties. The Prime minister is the executive head of the government assisted by at least twelve cabinet members who are members of Parliament.

(b) **Demography.**

The population of Jamaica is approximately 2.417 million. Of this amount, 91.4% is of African descent, 1.2% Chinese and Afro-Chinese, East Indians 3.4%, whites, 3.2% and other races 0.8% 18. This multiracial society is aptly described in it's motto, "Out of Many One People". Based on the provisional count of the 1982 census, the overall density of the population was 205 persons per square kilometre as compared to 130 per sq. km. for the Caribbean region. 19.
Figure 14

(c) **POPULATION DISTRIBUTION.**

According to the population census of 1982, a little less than half of the population live in the Kingston metropolitan Region. (KMR). 20.

This is due mainly to the following reasons:

(1) Natural increase.

(2) internal migration.

This urban drift or population concentration is due primarily to the dynamics of job opportunities and the fact that the two tertiary institutions, the University of the West Indies and The College of Arts, Science and Technology are to be found in these two urban Parishes.

An outstanding feature of Jamaica's population distribution is the rapid growth of settlement in the parish of St Catherine. In 1970, this parish accounted for 9.9% of the islands population. By 1982 this proportion had increased to 15.2% showing an overall percentage increase of 81.9% and representing an annual growth rate of 5.1% (V. Gordon) 21. This increase is attributable to the low income housing development in the portmore region and the access to transportation facilities where residents commute on a daily basis to their jobs in the Kingston Metropolitan region (KMR). The parishes of St. James, St Anns and Portland are experiencing a large concentration of the population being major tourist resort areas.
1:11. **Economic Overview.**

Jamaica is considered as one of the 35 middle income countries of the world and to a large extent exhibits a free market economy in which the private sector is the more dominant.

The economy has undergone and continues to experience serious economic structural adjustments in the face of partial world recession, steep decline in bauxite earnings, escalating oil import costs, increasing unemployment and high inflation mixed with with a weakening dollar.

The economy is literally tied to the North American market since a large portion of it's trading is done within the United States market. This situation has resulted in the Jamaican dollar being tied to the United States currency and currently exchanges at 27.50 to $1. USD.

Additionally, the situation has led to the price of goods imported being excessively high and also the removal of subsidy from imported goods hence inflation currently runs as high as 45%. Jamaica in an attempt to acquire needed but scarce foreign exchange borrows substantially from the International Monetary Fund. (IMF). "The country currently has a standing agreement with the IMF and the gross national product is projected to increase by 4-6% for the current year". (1990-91).
1:11.A. **Industries And Natural Resources.**

The Jamaican economy is entirely resource based. The large income earning sectors relative to the coastal zone are tourism, agriculture, bauxite and ports and shipping.

1:11.B. **TOURISM**

Tourism is a fast growing and significant activity in Jamaica. Tourist arrivals in 1990 total 1,236,075. According to the 1990 Economic and Social Survey of Jamaica, this figure represents a 6.3% increase over the 1989 figures. The survey also reports a gross foreign exchange earning of USD.740.0 (provisional) from tourism spending for 1990 which is considered to be an increase of 24.8% over the 1989 figures. (ESE 1990) Tourism is based on the favourable climate and the attraction of the coastal and marine resources. The major tourist growth centers are located on the northern coastal zone and mainly within the major coastal towns. (see figure 12).

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**Figure 12**

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The industry has in the past decade become the largest source of foreign exchange earnings due to the following reasons:

(1) Intensive marketing and promotional activities undertaken by the Jamaica Tourist Board.

(2) Improved transportation links with North America and the United Kingdom and;

(3) The strengthening of European currencies vis a vis the United States dollar, which improved the competitiveness of the Caribbean destination.

The industry is currently under expansion and given the high expectations coupled with major investments from the private sector it is envisaged that this industry will achieve tremendous growth in the foreseeable future.

1:11.C. Mining.

The mining and processing of bauxite is one of the mainstays of the Jamaican economy. The industry is not labour intensive but its workers are among the most skilled and well paid in the country.

Bauxite sites are located mostly inland but the main coastal ports serve as important trading points. This industry was stabilized in 1986 following three years of international decline reducing the number of companies to three (two alumina producing plants) (Alcan and Clarendon Aluminum Plants) (CAP) and one bauxite mining company, Kaiser.
The government has rationalized this sector and continues to be involved in the marketing of bauxite and alumina through the Bauxite and Alumina Company. The total bauxite production was valued at $10.9m (USD) for 1990.

1:11.D  Agriculture.

The agriculture sector plays an important role in the economy. Approximately, 1.5m acres or (55%) of land space is utilized for agricultural production and is primarily within the coastal zone. The rural urban poor however carry out small scale agricultural production on mountainous and fragmented farms from which they earn a living. Much of the poor hillside agricultural practices are subject to land slippage and erosion due to poor soil conservation methods on these plots.

This sector is the largest source of employment accounting for approximately 36% of the Jamaican labour force. (ESE 1990).25.

The traditional crop includes sugar cane, bananas, citrus, pimento, cocoa, coconuts, ginger and tobacco.

In this sector the aim of the government has always been to encourage diversification. Positive signs have been seen in a number of vegetables, tropical and sub-tropical fruits, tubers and horticulture being exported.

Historically, the sector consisted of two main sectors namely:

(1) Estate production of major crops and lifestocks.

(2) Small holdings producing staple food crops and some life stock for domestic consumption.
This traditional division has changed somewhat over the past three decades with estate production declining in importance and the emergence of more medium sized farms ranging between 40-25-100 hectares.

The total earnings from this sector for 1989-1990 was USD: 161.3m. (ESE 1990).

1:11.E. Ports And Shipping.

In maritime terms, Jamaica is a leading force in the Caribbean in that the Port of Kingston has developed into a major container and transhipment port. This was possible due to the strategic location of the island, representing minimal deviation from the trade route utilizing the Panama canal situated only 32 miles from the major east west arterial trade route via the panama canal. This Port is the seventh largest natural harbour in the world with approximately eight miles of navigable water and a depth of approximately 90 feet. (see figure 13).

**FIGURE 13 LOCATION AND TYPES OF PORTS IN JAMAICA**
This Port consist of a diverse mix of cargo handling facilities including an ultra modern container terminal, breakbulk wharves, an oil refinery for bulk petroleum products and dry bulk terminals for handling gypsum, limestone, cement, grain and lumber.

During the twelve years of operation, The Port of Kingston handled 253,000 TEUS up to 1987. The traffic today averages about 90,000 moves or just over 1000,000 TEUs (World Container Ports to 2000, Ocean Shipping Consultants, 1986).

In addition to the Port of Kingston there are a break bulk wharf, two modern cruise ship piers at Ocho Rios (a leading tourist centre), The Port of Montego Bay, (also located in the tourist capital) and the Port Antonio Cruise Ship Terminals.

There are roughly, twelve ports in Jamaica. Bunkering facilities in the Port of Kingston are provided by three oil companies operating in the island namely: Shell, Esso and Texaco Caribbean. These Companies are located in the heart of the coastal zone. It is evident that these industries are major contributors to the pollution of the Kingston Harbour. However, a later chapter will expand on this issue.
Summary.
This chapter has focused on the physical, demographic and economic configurations of Jamaica. Recalling it was pointed out that the coastal zone of Jamaica exhibits diverse environmental, ecological and economic features. Some general concepts of the coastal zone were discussed and it was explained that although definitions vary between countries and individuals, the coastal zone is generally accepted to be the interface between the land and the sea.

This discussion has also emphasized that the coastal and marine resources are the foundation of the economy of the country, but that unfortunately they are not being exploited in a sustainable way. Consequently, evidences of degradation and depletion are manifested and therefore, new management geared towards the preservation and protection of these very important resources is urgently required.
References and Notes
Chapter One
2. Economic and Social Survey of Jamaica, 1990
7. IBID.
12. Ibid.
17. Ibid.
18. Ibid
19. Economic and Social Survey of Jamaica, 1990
20. Ibid
Chapter Two.

The Uses Of The Coastal Zone.

This chapter describes the uses of the coastal zone, as they affect the zone and how they interrelate with each other. The primary objective however, is to determine the extent to which development within the zone is sustainable. Accordingly, a matrix will be used to highlight the different user conflicts which often arise as a direct result of unplanned development and unsustainable exploitation of the resources.

The question therefore arises, is development within the coastal zone sustainable? One way of answering this question is to describe the developmental activities within the zone which contribute to the ongoing degradation of the very foundation on which they are built.

The coastal zone of Jamaica supports the following major economic activities:

(1) Urban Settlements.

(2) Tourism

(3) Artisanal Fisheries.

(4) Maritime Transport
   (a) Ports
   (b) Shipping.

(5) Agriculture.

(6) Industry.
Waste Disposal.

Recreation.

The gregariousness of industries within the zone can be attributed to several factors. The foremost of course being the availability of cooling water which is utilized in the production process. Another advantage is the fact that water transport is cheaper therefore, siting along side the port reduces economy of scale.

The basic infrastructure on the coast has already been developed, for example, access roads, major highways and telecommunication facilities. Thus, there is no further need for expenditure in this regard. This, however, does not suggest that efforts at preventative maintenance would not be given priority.

It is also on the coast that many population centres are located given inducement to a ready supply of labour. The population concentration in the coastal zone of Jamaica attests to this phenomenon.

At this point, attention will be focused on the different uses of the coastal zone.

2:1 Urban Settlements.

The existing geographical features significantly affect settlement patterns in Jamaica. Settlement is considerably restricted in those areas of steep and rugged terrain in the centre of the island and in regions of swamp around certain sections of the island.
Consequently, more than 80% of the total population lives within five miles of the coastline and the major urban and industrial activities are likewise concentrated in the same area.

It was considered necessary to review the contributions of previous writers on this particular issue. However, it was the work of Eleanor Jones which proved most useful.

She noted that of the 4411 square mile of the island, 400 square metres of this surface lie at or below fifty feet and that within this elevation some 163 settlements lie. She further reported that estimates have revealed that approximately 135,000 people live below the 20 feet contour in the highly vulnerable Kingston and St Andrew conurbation. Some 45,000 settlements are located in this zone.

She further emphasized that in the eleven other parishes an additional 135,000 persons live below the 50 feet contour and that there are some 36,000 dwellings. 1. (see figure 14)

Based on the above stated explanations, therefore, an estimated 313,000 persons and 81,000 dwellings are located in the coastal zone. This statistical evidence serves to illustrate though in an implied fashion, the extent to which serious structural planning needs to be done to cater for such immense population growth.

An outstanding feature of Jamaica's settlement patterns is the phenomenal growth of the parish of St. Catherine. In 1970, the population in this parish accounted for 9.9% of the island's population. By 1982 this proportion had risen to 15.2% thus showing an increase of 81.9% and an annual growth rate of 5.1%. 2
This expression of population explosion is attributable to the growth of a number of middle to low income residential areas such as Portmore which is built on reclaimed wetland marshes.

The growing rate of population density in this region will be further exacerbated by the proposed plan of the government to build 10,000 low income houses in Portmore. Naturally, added pressure will be brought to bear on the existing waste disposal and sewage facilities.

2:1.A Factors Encouraging Rural Urban Migration

It is considered useful to discuss the factors which have encouraged rural/urban migration in Jamaica.

As was previously indicated, a vast majority of the Jamaican population is concentrated in the parishes of Kingston, St. Andrew and St. Catherine. This urban drift is due primarily to the dynamic job opportunities and the fact that the two main tertiary institutions, the University of the West Indies and the College of Arts Science and Technology are located in the Kingston Metropolitan region.

Another factor of great concern is the stigma attached to agricultural production. The pattern of agricultural growth does not make a strong impact on rural poverty therefore, the poorer people still migrate to the cities to seek employment. Today, a vast majority of the population no longer wish to be involved in farming therefore, especially, the younger population migrate to the urban centres particularly, Kingston and St. Andrew and the major tourist towns such as Ocho Rios, Montego Bay and Negril to
seek employment. The majority of this group are women who opt for employment in the service sector.

Already there is an unemployment rate of 18% in the island. External migration has been a blessing in disguise. This trend has resulted in reducing the number of job seekers. However, the steady flow of job seekers to the urban areas continue to exceed the rate of job creation and to surpass the capacity of both urban industry and services to absorb the labour effectively.

Another built in factor which encourages rural urban migration is the income differential. It is known that the rate for labour is higher in the urban areas than the rural. This motivates young people to abandon the "dark, dull" style of country living for the "bright, vibrant", city life.

Although, the chances of obtaining a job in the urban areas are slim, migrants still prefer to abandon their country abode for city life. The primary reasons are the access/or availability of cultural and social amenities, better housing, improved diet and improved standard of living.

Many rural populations in Jamaica still lack access to better infrastructure; such as adequate communication facilities, for example, transportation, access roads, television/videos etc. Increased urbanization also has socio-economic consequences which will be examined at this point.


The 1990 Economic And Social Survey of Jamaica records the predominance of females in the 20-44 year age group.
This has implications relative to social amenities. The majority of migrants are females who are in the peak fertility age group. Their departure from the rural areas not only reduces the population of these areas but it increases the population of the urban areas. Subsequent to settling down, most of these females begin to reproduce thereby increasing the urban statistics and adding further pressure on the limited social facilities and spatial absorption capacity of the coastal zone.

Indicative of this are the grossly overcrowded schools and poorly equipped hospitals. Some of the departments at the University and the Kingston Public Hospitals have been closed due to the paucity of funds. The other social services are unable to keep pace with the added demands.

As regards housing, there is already a spatial problem. The most serious impact of this growing urbanization is the mushrooming of marginal settlements within and at the periphery of these cities. A large percentage of the population live in overcrowded makeshift shelters or "squatters residence" which lack basic sanitary facilities, clean water supply and proper disposal facilities.

Some of these areas, to name a few, include the Riverton City squatters area which is also a recognized dump site for the island. At times, it is virtually impossible, to differentiate the residential community from the garbage.

Another known site, is the Warieka Hills. It is known that the these residents dump their waste at the foot of the hill which subsequently washes into gullies during heavy rainfalls. Unfortunately, the growing urbanization has resulted in "squatters" zones.
The availability of the basic facilities as mentioned in the above paragraph have not kept pace with the population increase in the coastal zone. Consequently, the sea is automatically used as "the big incinerator" for all the ill disposed of garbage.

Expansion of the urban centres have resulted in the increased discharge of inadequately treated sewage into the coastal waters. This action has resulted in the degradation of mangroves and coral reefs thereby reducing the nursery areas of fish and shrimp species.

Urban development has also occurred on potentially productive agricultural lands or wetlands areas. This is particularly true of urban growth which has taken place in the general area of Kingston Harbour. "The disruption in the harbours aquatic food chains as a result of wetlands filling has resulted in sharp declines in this formerly prolific area. (Jam. Profile)". 3. What are the policy implications of the above situation.


The foregoing discussion has revealed that the development strategies in Jamaica have an urban bias. In spite of the many governmental programmes, rural/urban drift has remained unchecked and the housing demands, especially, in the Kingston Metropolitan area remain acute.

There needs to be a policy in place to discourage rural urban migration. This policy should of necessity be integrated into the national development plan and should take into consideration the rural development strategy to reverse the flow of the population out of the rural areas.
and stimulate development of agriculture to increase the number of available jobs. Agro based industries should be encouraged in these areas.

While recognizing the efforts of the government to increase agricultural production through different land use policies there is the need to improve and develop prime rural areas to avert this drift.

There should also be population policies to limit the density in certain areas. A fertility policy should be promoted with the sole purpose of addressing this issue which is growing out of proportion.

2:2. Tourism/Recreation.

Tourism is regarded as an important activity in Jamaica because of its impact on income generation, its stimulation of investment and employment and its contribution to the foreign exchange earnings. Since 1985, tourism earnings have accounted for the largest source of the country's foreign exchange earnings. In 1990, the contribution of this sector to the gross national product (GDP) was USD.740m. (1990 ESE).4.

The growth of the tourist trade is reflected in the growth in visitor arrivals and expenditure. Table 1. depicts the total visitor arrivals to Jamaica for the period 1985-1990.
As can be observed, visitor arrivals totalled 1,236,075, which is said to be a 6.3% increase when compared with the 1989 figures. This increase is attributable to the increased level of stop-over visitors and armed forces arrivals.

B) Employment.

One of the multiplier effects of tourism is reflected in its direct contribution to employment in the island. Table 2. shows the direct employment in tourism accommodation during the period 1980-1990.

### Table 1

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<tbody>
<tr>
<td>Changing Visitors</td>
<td>571,713</td>
<td>663,593</td>
<td>738,827</td>
<td>648,873</td>
<td>714,771</td>
<td>840,777</td>
<td>17.6</td>
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<tr>
<td>Air Passengers</td>
<td>261,508</td>
<td>270,507</td>
<td>292,156</td>
<td>367,732</td>
<td>444,054</td>
<td>385,205</td>
<td>-13.3</td>
</tr>
<tr>
<td>Armed Forces</td>
<td>13,392</td>
<td>12,531</td>
<td>6,651</td>
<td>3,688</td>
<td>4,411</td>
<td>10,093</td>
<td>128.8</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>846,716</td>
<td>954,621</td>
<td>1,037,634</td>
<td>1,020,293</td>
<td>1,163,236</td>
<td>1,236,075</td>
<td>6.3</td>
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Average Length of Stay (Nights)

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<tr>
<td></td>
<td>9.8</td>
<td>10.2</td>
<td>10.1</td>
<td>10.3</td>
<td>10.6</td>
<td>10.9</td>
<td>2.9</td>
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Source: Based on data supplied by the Ministry of Tourism.

### Table 2

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<tbody>
<tr>
<td>Kingston &amp; St. Andrew</td>
<td>1,124</td>
<td>1,145</td>
<td>1,230</td>
<td>1,014</td>
<td>1,360</td>
<td>1,347</td>
<td>1,356</td>
<td>1,289</td>
<td>1,247</td>
<td>1,330</td>
<td>1,307</td>
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<tr>
<td>Montego Bay</td>
<td>4,315</td>
<td>4,723</td>
<td>4,960</td>
<td>4,922</td>
<td>5,000</td>
<td>6,715</td>
<td>6,660</td>
<td>6,738</td>
<td>6,772</td>
<td>7,040</td>
<td></td>
</tr>
<tr>
<td>Ocho Rios</td>
<td>2,520</td>
<td>2,860</td>
<td>2,721</td>
<td>3,044</td>
<td>3,688</td>
<td>4,351</td>
<td>4,292</td>
<td>5,004</td>
<td>5,389</td>
<td>5,728</td>
<td>7,280</td>
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<td>Port Antonio</td>
<td>3,350</td>
<td>3,399</td>
<td>3,538</td>
<td>3,570</td>
<td>3,699</td>
<td>4,528</td>
<td>4,504</td>
<td>4,477</td>
<td>4,777</td>
<td>4,836</td>
<td>4,360</td>
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<tr>
<td>Mombello &amp; South Coast</td>
<td>950</td>
<td>90</td>
<td>113</td>
<td>134</td>
<td>154</td>
<td>199</td>
<td>212</td>
<td>255</td>
<td>255</td>
<td>279</td>
<td></td>
</tr>
<tr>
<td>Negril</td>
<td>1,176</td>
<td>1,176</td>
<td>1,166</td>
<td>1,136</td>
<td>1,123</td>
<td>1,160</td>
<td>1,127</td>
<td>1,257</td>
<td>1,206</td>
<td>1,111</td>
<td></td>
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<tr>
<td><strong>JAMAICA</strong></td>
<td>9,527</td>
<td>10,633</td>
<td>11,290</td>
<td>11,437</td>
<td>12,654</td>
<td>13,619</td>
<td>15,050</td>
<td>16,356</td>
<td>17,076</td>
<td>18,541</td>
<td>20,561</td>
</tr>
</tbody>
</table>

Source: Ministry of Tourism.
As can be observed from the table, a total of 20,561 persons were directly employed in the tourism accommodation sub-sector. This represents an increase of 10.9% when compared with the 1989 figure of 18,541. The major tourist resort areas of Ocho Rios, Montego Bay and Negril contributed 7,326, 7,040 and 4,113 respectively.

2:2.1 Investments.

The overall economic benefits already gained from tourism in Jamaica make tourism development more tempting, if not, inevitable. For instance, the level of investment during the period under review and the proposed investment for 1992 will further illustrate this point.

Throughout 1990, there were significant investments in this sector. Loans to the sector during 1990 were J$748.65m. According to the Economic And Social Survey for 1990, this figure accounted for 8.3% of the total outstanding loans and advances to the productive sector. The industry is currently under going further expansion and hardly a day passes without the announcement of a new multi-million dollar project.

Projected major developments for 1992 earmarked for tourism include the following:
(1) Montego Bay Drainage Flood Plain Project.
(2) Ocho Rios Cruise Ship Project.
(3) Montego Bay Sewerage System Improvement.

There is no denying of the fact that tourism earnings have contributed significantly to the Jamaican economy. Tourism
earnings play a major role in alleviating the chronic balance of payment deficit in Jamaica. Without tourism these deficits would be unmanageable. Since tourism is so important as it relates to its earning potential, the expenditures on coastal zone developments are justifiable.

Conversely, the type of tourism development that is pursued in Jamaica has led to serious environmental problems and in most cases, the very revenue that is received from tourism has to be used to remedy the damages incurred through tourism activities. Some of these problems, to name a few, include beach erosion, caused by tourism development and groynes built in inappropriate areas and pollution caused by poor sewage treatment and disposal from tourist facilities.

It is therefore, important for our Jamaican planners and developers, to realize that our tourism product is in fact our environment. It is our culture and cultural heritage, our physical resources and physical beauty, that we invite our visitors to experience. Shall we therefore, destroy our environment at our economic peril?

2:2.2 Recreation.

Another use that is made of the Jamaican coastal zone is for recreational activities such as swimming, sports fishing, snorkeling, pleasure boating, water skiing and surfing.

Recreation is therefore, mostly marine related. A popular marine activity is sport fishing which is carried out in close proximity to the island's reef. Regrettably, this activity significantly impacts on the reefs which
support the island's artisanal fisheries.

Water sports activities cannot go unmentioned.

This activity not only serves as a means of entertainment to tourists but also as a means of livelihood to the many nationals who operate them.

These sporting activities however, are not properly managed and tourists are also frequently seen harvesting the black corals and cutting the mangroves for usage in their camp fire. This practice is harmful to the environment as was established in chapter one. DR. Ivan Goodbody's prescription, "Swim but not Touch" should be the guiding principle to the users of the beaches.

Recently, the government has announced plans to diversify the recreational activities available to local and overseas tourist. Towards this end, the government has created the Ministry of Tourism and Environment to be responsible for coordinating and developing plans relative to eco-tourism.

2:3 Agriculture

Intensive agriculture occurs within the central part of the island as well as along the delineated coastal zone. Despite the rapid growth in tourism, agriculture is still the largest source of employment accounting for 36% of the labour force.

During the period 1989-1990, the total earnings from this sector was USD.161.3m (ESE 1990).6. This is said, to be the highest level for the past ten years.
The agricultural sector occupies about 55% of the total land area of Jamaica. Farms range in size from a few acres up to 500 and above. 7.

Sugar cane and bananas, though traditional crops, are still the major crops produced for export earnings and which are grown on monoculture plantations on coastal alluvial plains and interior valleys.

Recently, the industry has been diversified. Positive signs are seen in the growth and export of a number of vegetables, tropical and sub-tropical fruits, horticulture and tubers which are grown on hillsides by small farmers.

According to the Economic and Social Survey of Jamaica, 1990, the estimated earnings from non-traditional crops during 1990 was US.$15.6m (ESE 1990).8.

Agricultural production, although a viable economic activity in Jamaica, is vulnerable to a number of factors, chief among them is natural disasters. As was indicated earlier, agricultural production is mainly carried out in the coastal plains and to a lesser extent on hillsides which exposes the crops to the mercies of the elements.

Hurricane Gilbert impacted severely on this sector during 1988. Damage to the sector was estimated to be J$710.6m with the loss in foreign exchange being USD.28.6m (ESE 1988-1990).9.

The effects of the hurricane which were highlighted in
chapter one support the need for sound watershed management to protect the country's agricultural resources; considering that the stability of the economy rests on this vital sector.

2.4 Maritime Transport.

Along the coast of Jamaica stand many ports. At present, there are ten active ports around the coastline. These comprise four bauxite alumina ports, three ports which export mainly agricultural products and the island's two principal ports, the ports of Kingston and Montego Bay. (see figure 15)
The port of Kingston provides container and transshipment facilities (public ownership) and general and break bulk domestic facilities (privately owned).

In 1990, a total of 1279 vessels visited the port of Kingston. These ships usually bring in raw materials and fuel oil, while taking out bauxite alumina, ethanol, petroleum products and agricultural products. Overall, a total of 2,277 vessels visited Jamaican ports during 1990. (ESE 1990) 11.

With regard to cargo volume, the ESE reported a decline. The total volume handled during 1990 was 1.7 million tons. This is said to represent a 12% decrease when compared with the 1989 figures. 12.

Domestic cargo also declined significantly by 17.0% or 1.23 million. On the other hand, transshipment cargo increased by 4% over 1989 to 0.48 million tons. 13.

The Jamaican ports based on their location occupy an extremely sensitive area of the coastal ecosystem. In addition, the islands strategic location at the intersection of major oil tanker lanes has made the island vulnerable to oil spills resulting from flushing of
contaminated ballast or accidents. It is this strategic location which served as impetus for Jamaica's ratification of the Marpol Convention.

Although the island has not experienced any major spills excepting the grounding of the tanker Eronda in 1981, which spilled 600 tons of oil in the zone, there is the need to be adequately prepared for any emergency in the future. In this regard, there is the need for the country to seriously consider the ratification of the Civil Liability Convention in conjunction with the fund convention which provides for compensation in the case of any major oil spills.

2:5 Waste Disposal.

Another use that is made of the Jamaican coastal zone is for waste disposal. Many solid waste products such as, domestic sewage, industrial waste and thermal waste are discharged into the coastal waters.

Waste problems in Jamaica are becoming acute and the volume of waste increases each year while the seas into which they are discharged remains the same.

The continued dumping of waste from industries and other sources has resulted in the pollution of most of the islands coastal waters. Kingston harbour is the most severe case of pollution in the coastal zone. This subject will be discussed more fully in chapter three.

Artisenal fishery in Jamaica is carried out by approximately 95% of fishermen operating from small boats in the coastal shelf and related banks in the island. The coral reefs which line the island and the offshore banks support the backbone of the demersal fish stocks. This reef fisheries is the main source of income for the artisenal fishermen in the island.

The fishing gears primarily used for harvesting reef fisheries are fish traps, pots hook and line, seine nets and spear fishing.

In 1990, this sector contributed 0.4% to the gross domestic product of the country. (Department of Statistics 1990).

In terms of employment, the fishing industry supports some 150,000 persons; hence overexploitation can only contribute to irreversible damage of this invaluable resource.

2:7 Industries.

As was indicated earlier, industries have traditionally sought a waterfront location in order to take advantage of the different facilities offered. The major industrial activities include, the detergent industries, edible fats and oil petroleum refineries, the power generating plants, the cement factories, food processing and agro-industries and the bauxite industries. These all occupy prime locations in the coastal zone.

The industrial sector accounted for export earnings of US $324.1m while providing employment for over 130,000

Summary.

It is apparent by now, that the uses of the coastal zone contribute significantly to the economic well being of the country. However, Jamaica has to begin to go beyond valuing the coastal zone in mere economic terms. It has to start valuing the life and integrity of the resources, hence conflicts occur as will be described below.

2:8. Multiple Use Conflicts Within The Coastal Zone.

Considering the small area of the coastal zone of Jamaica and the multiplicity of activities carried out in this limited area, it is evident that the problem of multi-use conflicts would be a critical issue. It would be useful to establish why conflicts arise.

Why Conflicts Arise?

The following reasons can be furnished as to why conflicts arise.

1) The perception that the coastal ocean resources are resilient, and inexhaustible with an infinite assimilative capacity.

2) Environmentalists agree that multiple use conflicts
arise when more than one use of a resource or a marine area preclude or adversely impinge upon the use of other resources or the same space by other users:

3) Socio-economic reasons. For example, when users compete for a scarce resource, such as the sport and commercial fishermen contending for exploitation of the same resources, the inevitable result, is conflict.

4) Conflicts often arise due to unplanned development and a sectoral approach to resource utilization and exploitation.

Having highlighted some possible reasons why conflicts arise attention will now be focused on spatial and land use conflicts between the different users of the Jamaican coastal zone.

2:8. Tourism - Spatial and Land Use conflicts.

The major spatial conflicts which currently affect tourism arise from impacts on a number of endangered species thus affecting the coastal eco-system.

The most important direct impact of tourism is the inherent extensive land use of the industry. The mounting tourism demands have placed a local pressure on the zone for expanded use of golf courses beach resorts water sports and other recreational area. Every available bit of coastal land is under great demand for this activity.

In an attempt also to achieve low density tourist sprawl quite a significant portion of the coastal and marine
habitat have been destroyed in the process of making adjustments to facilitate this activity. The most obvious irreversible impact therefore is the loss of eco-systems such as mangroves forests, dunes or cultivatable land.

As was indicated earlier, much of the tourism industry has developed around the marine eco-system and these resources continue to be the biggest attraction for them. The sheer presence of large numbers of people creates an increasing pressure on the remaining natural and cultural environment. The breaking of corals, the trampling of vegetation and littering are just a few examples.

A notable case of development and spatial conflict is found along the north coast where the location of sewage outfalls and the increasing load added to the system is in danger of exceeding the capacity of the plant thus threatening the quality of the bathing beaches.

Recreational activities such as snorkeling and boating frequently cause damage to reefs and it is perceived that in several areas these activities should be better controlled and curtailed. In response to this need regulations to control aquatic sports were passed in 1958. (Tourist Board Regulations, 1985)

Based on the above, there is still an urgent need to rationalize the process involving the location of marinas and piers with respect to bathing areas and areas allocated for active water sports. This consideration should be promoted from the national level.

Another area which should not be ignored is the growing conflict which involves the restriction of significant portions of the populace from the prime recreational beaches.
In the 1970’s the beach resources were monopolized by the minority of private beach front operators to the detriment of the majority of the populace. Locals were debarred from entering and using beach facilities owned by private beach front operators. For example, locals were not allowed entry to Doctors Cave beach in Montego Bay. As was expected the locals did not react kindly to this situation since it was perceived to be an act of discrimination.

Beach front hotel owners have repeatedly sought to fence off access to beach areas bordering their properties and restrict swimming in the near shore waters by all except hotel guests.

However, the turning point came in the 1970’s when the government in a move towards equality and social justice for all decided that this disparity should be removed. Accordingly, the government embarked on a programme of nationalization, thereby significantly restricting this practice.

It is important to note that The Beach Control Act of 1970 stipulates the right of access to areas of national interest and to the foreshore. Recently, it has been observed that beachfront operators still try to perpetrate this practice. Therefore, it becomes necessary for the government to once more re-examine the issue with a view to upholding the decision made in the 1970’s.

2:9. Spatial And Land Use Conflicts of Agriculture.

The existing pattern of land use within the agriculture sector and other uses is the result of years of unplanned development. This has led to the urbanization of a major
portion of the best agricultural lands particularly in the St. Catherine plains of the island. Consequently, a large number of the farmers are forced to do hill side cultivation which is frequently affected by land slippage and soil erosion due to poor soil conservation methods.

There are also conflicts for the use of land within the agricultural sector between the small farm owners, the landless farmers on the one hand and the large land owners on the other. Several cases of squatting exists where landless farmers occupy land owned by the government or other individuals and put the land into production. Once the land is required by the owners, these farmers are displaced without having the benefit of reaping their current crop.

There is now an increasing awareness of the need to resolve such conflicts to prevent agricultural lands from being used for other purposes and to ensure that land is used for the best suited purpose. In this regard, various classification systems are being employed to determine the agricultural capability of land and maps now exist which serve as a major guideline geared towards the resolution of some of the conflicts with respect to the use of agricultural lands. Having assessed the whole scenario which bespeaks the different conflicts of uses one would have expected that the process of conflict resolution would have been expedited by the authorities in control.

2:10. Spatial And Land Use Conflicts Of Industries.

Spatial and land use conflicts caused by industrial development are quite acute in the Rockfort area of the Kingston Metropolitan region. The Caribbean Cement Company, the largest manufacturer of cement in the Caribbean was established in the 1960's prior to the
sub-division of the surrounding lands. Within the next 10 years, the Harbour View residential complex was built up and presently houses over 20,000 residents. Over the same period, other industries became established and the residents of the adjacent areas experienced problems due to the large amount of dust and smoke generated chiefly by the cement factory.

In addition to the above their water supply had been contaminated due to saline intrusion into the aquifer due to chemical waste disposed of by one of the companies in the area. Consequently, an alternate source of water supply had to be introduced into the area at great cost to the municipal water company.

It should be noted that quite a large majority of the Jamaican industries have not developed proper waste disposal methods and from time to time, they indiscriminately dispose of their waste in unrecognized dump sites. A recent example was the disposal of phosdrin, a toxic chemical by a reputable company in the Riverton area dump site which resulted in the death of several thousand pigs who were infected.

Although there is an industrial estate in the island's water front, industries are frequently located in residential areas thus resulting in an acute shortage of houses on the island. A recent development on the island is the conversion of some private residential complexes into commercial enterprises. This action is a reflection of the lack of enforceable regulations governing proper land use planning in the country.
2:11. Spatial And Land Use Conflicts Of Artisanal Fisheries.

The artisanal fisheries grounds of Jamaica are continually being lost or damaged in the face of development for agricultural production, beach front construction, port development and aqua-culture production. These issues will be assessed separately.

2:11.A Beach front development.

The clearing of the mangroves at the mouth of the Pye River delta in Montego Bay to construct the 5000 unit Catherine's Hall housing development and subsequent work to construct the Montego Bay Free Port has resulted in the destruction of the fisheries habitat around the Bogue Island.

Another such action was the dredging and reclaiming of the lands surrounding the Fletcher's beach initiated by the Urban Development Corporation to provide additional beach facilities. Although this activity achieved the desired objective of earning additional hard currency, no consideration was given to the lost of this prolific fishing area. Consequently, the artisanal fishermen were forced to go further off-shore to fish for their livelihood. Additionally, in an attempt to facilitate urban development in the Portmore, Edgewater and Bridge Port areas, several hundred acres of salt marshes were reclaimed and used to site low income houses. This action resulted in the decimation of stocks of fin-fish and shrimp through the disruption of breeding and nursery grounds.

2:11.B. Agricultural Development.
Many agricultural projects have been sited on lands where mangroves and salt marshes once flourished. A case in point was the Hague swamp near Falmouth in the western end of the island which was drained and the mangroves removed in 1977. 15. The reclaimed land was used to establish a rice plantation. Similar actions reported included the channelization and drainage of the Negril Morass in the late 1950's for agricultural development.

It can also be recalled that in the 1980's the Black River Upper Morass was separated from the Black River by dykes and the wetlands were transformed mainly for rice production. This action resulted in the pollution and destruction of fisheries habitats.

In the last twenty years, large areas of wetlands have been filled for housing and roads eg. Portmore, St.Catherine, or drained for agricultural use, for example, Black River Upper Morass.

The pressure on the remaining wetlands is considered to be great as a result of the continuing demand for flat land for housing and agriculture. Undoubtedly, the losses in coastal organic productivity have been significant.

2:11.C Port Development.

The expansion of the maritime sector in Jamaica influences the carrying out of many activities by the appropriate authorities with the purpose of developing, expanding, upgrading and modernizing port facilities. These developments often resulted in dredging, and channelization of water front to accommodate larger ships into the harbour. It is an established fact that dredging activities are detrimental to the marine and coastal
species. Furthermore, the fishermen whose livelihood is threatened by the negative impacts of these activities often react bitterly since their means of economic support is challenged.

It can be recalled, that when the Port Rhodes was being built a channel was blasted through the adjacent reef and the dredged spoils dumped on a known fishing area. This action resulted in serious conflicts between the fishermen and the Local Authorities. In putting forward their case, the fishermen argued strongly that the dredged spoil would seriously affect the fish harvest.

There are many other such cases of conflicts which could be reported however, the paucity of time does not allow for this.


Jamaica is said to be the second largest aqua-culture producer in the Caribbean. However, the clearing of wetlands to construct aqua culture ponds have reduced the nursery grounds for many types of fish. This clearing often leads to reductions in the commercial fish stock.

In contemporary Jamaican society, it has become apparent that the marine sector faces serious multiple conflicts for
its habitats from the various users of the coastal zone. Constraints have arisen due to shortage of fishing grounds. The fishermen continue to face serious crisis as their livelihood continues to be threatened.

Summary
The need to approach the use of the resources in a wholistic way is extremely important in the zone where conflicting uses are most acute. The use of the zone needs to be properly monitored and the various interactions need to be taken into account while exploiting the resources. It is therefore, obvious that for a reduction in conflict to be realized there must be co-operation between the users.

The matrix enface, is used to illustrate some of the main conflicts which frequently arise between the different users of the coast. In Jamaica, these user conflicts pose a considerable challenge and are relatively difficult to solve due to the different perceptions of the various users of the coast.

The analysis of conflicts /interactions may reflect one use having a strong positive (++), moderate positive (+), strong negative (--), moderate (-), or neutral interaction (0).

As can be observed from the matrix, the activities that take place within the zone are many and varied. Some indications of the diverse range of activities are also highlighted.

Clearly, some activities are totally incompatible with each
<table>
<thead>
<tr>
<th>PORT DEPLOIT.</th>
<th>WASTE DISPOSAL</th>
<th>AQUA-CULTURE</th>
<th>TOURISM</th>
<th>AGRI-CULTURE</th>
<th>RECREATION</th>
<th>URBANIZATION</th>
<th>INDUSTRIES: FISHING</th>
<th>AESTHETICS: MARITIME TRANSPORT</th>
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<td>AGRI-CULTURE</td>
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<td>AESTHETICS: MARITIME TRANSPORT</td>
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</tbody>
</table>

The key can be obtained at paragraph 3 of the Summary
other, for example, waste disposal and artisanal fisheries, or tourism and aquaculture. It follows therefore, that the multiple use of the coastal zone requires close control.

It is not intended to discuss all the various conflicts which may arise between the different users most of them are self-explanatory. However, it is considered necessary to discuss one or two of the activities which are not immediately obvious and which are sometimes subject to different interpretations. In this regard, port development versus waste disposal will be discussed, subsequent to tourism versus port development.

Port Development Versus Waste Disposal.

Waste disposal is usually perceived as having a negative impact on any activity, or is likely to cause harm in relation to a conflict of use situation.

However, it should be noted that this perception is not always true, in view of the fact that there can be a positive co-relation between both activities.

If port development includes the establishment of reception facilities, the impact on waste disposal would be more positive than negative based on the fact, that this action would of necessity result in the reduction of waste disposal into the coastal environment. In Venezuela, for example, bilge water is recycled in which the oil is separated from the water, thereby minimizing incidents of harmful substances into the coastal and marine environment.

Conversely, if during the port development process dredging
operations are carried out in which garbage, waste spoils and mud are deposited into the coastal and marine environment certainly, the inevitable result will be conflict.

Port Development Versus Tourism.

Port development can result in increased maritime transportation which is good for the economy. Recalling, that the development of the two deep water berth/piers in Ocho Rios resulted in an influx of cruise ship visitors to the island is a situation which must be emphasized.

Conversely, increased transportation can interfere with fish harvesting. This activity also has implications for water quality. It is known that the water surrounding ports often contains oily substances which affects water quality.

It is also important that the principal actors involved consider that the same marine space which is used for tourism is simultaneously used for maritime transportation. In this case, the concurrence of both activities would certainly conflict for use of the beach areas since they are both relatively important to the country.

Similarly, development of a container terminal which would likely increase the oil tanker traffic, has implications for water quality especially, for Jamaica where tourism is coastally based. Also, bilge residues which wash onto beaches affect the quality and standard of the tourist industry.

The second part of this chapter attempts to highlight some
of the possible reasons why conflicts arise. In the same vein, it is considered important at this point, to focus on some of the ways in which conflicts can be resolved.

Resolution of Conflicts.

The following prerequisites are important to conflict resolutions.

1) Community Involvement.

In developing management schemes, many authorities have failed to solicit the views of those who will be mostly affected by them. Any national policy should of necessity involve wide ranging consultations with citizens groups. It is important to involve the public so that the regulatory system is not seen as oppressive and insensitive to the peoples needs and desires.

If the above condition is not met, people will seek ways of evading regulations, if they consider them to be unreflective of their needs. When people participate in making decisions which will govern their lifestyles, they will feel obligated to conform.

Additionally, community involvement is essential for the reduction of confrontation between user groups and enforcement authorities.

2) Another method of resolving conflicts is through integrated coastal zone management. The sectoral approach to resource management and exploitation in Jamaica, has
inevitably resulted in conflicts among the different users of the coast. It is therefore, imperative that the approach to coastal zone management be integrated. This could be streamlined through national and regional development policies. Therefore, the setting up of national and regional committees will allow for; interrelation, interdependence and interconnection of the various uses of the coastal and marine environments, all being focused on conservation of the resources and sustainable development for present and future generations.

Summary

The coastal resources of Jamaica are important because of the significant economic contribution that they make to the economy of the country. However, the method of resource exploitation has resulted in user conflicts within the zone. Therefore, for a reasonable balance to be met in this regard, it will necessitate methodical planning and good foresight.
References and Notes for Chapter Two.

2. Economic and Social Survey of Jamaica 1990
3. Ibid
4. Ibid
5. Ibid
6. Ibid
7. Ibid
8. Ibid
10. Ibid
11. Ibid
12. Ibid
13. Ibid
CHAPTER THREE.

The State Of The Coastal Environment Of Jamaica.
Problems Associated With Development In The Coastal Zone Of Jamaica.

The rapid growth in population and the attendant quest for economic development have impacted significantly on the natural resources of Jamaica. Consequently, renewable resources such as marine fisheries and coastal ecological systems have been virtually depleted some to the brink of extinction. This is evident in the current patterns of development within the coastal zone of Jamaica which continues to result in the abuse and misuse of the coastal environment as well as the resource base. Some of the effects of development on the coastal resources are made manifest and are among the worst areas of degradation and human impacts. These are outlined as follows:

1) Destruction of ecologically sensitive areas.

2) Pollution.

3) Beach Denudation.

4) Overfishing

5) Coastal Erosion

This chapter will attempt to assess and analyze these critical issues and their effects on the coastal zone of Jamaica.

The following ecosystems will be discussed under the above captioned.

A) Coral Reefs
B) Mangroves forests.
C) Seagrass Beds
D) Coastal Wetlands


Coral reefs are called the rain forests of the seas. Biologically, they are considered to be the most productive eco-systems on earth with a very sensitive balance. The following quotation reinforces the point and brings to focus a clear idea as regards the numerous possibilities of plant and animal life.

"The living reefs provide shelter for adult fish and attachment for plants and animals. This association of corals, fish sponges, sea anemones algae and other organisms, form a complex world with a variety of life nearly as high as tropical forests". (Super Channel, Sunday, July 24, 1992).

Coral reefs extend almost continuously along the edge of the continental shelf of Jamaica from Negril in the far western end of the island to Morant point on the eastern end. (see figure 17).
In most areas these reefs are presently threatened by both land based and offshore sources of degradation to the extent that they are being significantly reduced.

The basic question for serious consideration is why have the reefs gone into decline? In this section efforts will be made to review some of the forces which militate against the development and preservation of the reefs.

Valerie Gordon identified the following six activities as the major contributors to the destruction of the reefs and which will be discussed separately. 1.

1. Increased Tourists Activities.

Much of the Jamaican tourism has developed around the marine ecosystem and these resources continue to be the biggest attraction for them. It is known that tourists from time to time during their sport fishing anchor their boats directly on the reefs. This is a dangerous practice which ultimately leads to the destruction of these living organisms. The reef is a living animal and it appears that many visitors are unaware of this fact.

Leslie Wallen, Director of the Montego Bay Marine Park purports that reef growth is slow and he noted that estimates range from 16 feet every 1000 years. 2. He, therefore, argues that better care and control should be exercised in the conduct of these activities so that these precious resources could be maintained.
Reports have also been made of tourists breaking off corals during their sport fishing activities. In addition, the local fishermen often hunt souvenirs which they sell to the tourists. This is also accountable for the vast quantity of black corals which are often displayed for sale in duty free shops at our international Airports. This confirms the fact that there are no enforceable preventative mechanisms in place to abolish this dangerous practice.

Another matter of great concern is the littering of natural areas due to the lack of adequate reception facilities in public beach areas. This garbage subsequently enters the marine environment during heavy rainfalls thereby contributing to the severe pollution which ultimately results in the destruction of the reefs. A lack of beach personnel prevents monitoring on a daily basis.

Also, the heavy visitor traffic on the beaches contribute to trail erosion which ultimately results in the reduction of sand to the dune areas. The footpaths also destroy the vegetation which supports the dune system. Beach erosion narrows the touristically usable stretch of land and jeopardizes the most important tourist resource.

Cruise ships also dump garbage that invariably sweeps ashore and pollutes beach areas. This has caused widespread concern among the local population who use the areas for recreation and fishing. It is therefore obvious why the population in these areas resent all forms of tourist development for it evidently attacks the core of their daily existence.
2. **Destructive Fish Practices.**

The use of dynamite and poisons as means to catch fish have had devastating effects on the reefs off the south as well as the north coast of the island. The use of explosive has been particularly devastating because it not only destroy the mature fish but also the fish lava and the very habitat of the fish. Clearly, this is a demonstration of ignorance on the part of the fishermen which has resulted in the partial destruction of their very "bread and butter".

The partial destruction of the causeway bridge in St Catherine has partly been attributed to the effects of this destructive fishing practice.

3) **Over-Fishing.**

The reefs especially on the north coast are said to be heavily fished. Goodbody contends that this phenomenon has resulted in the disappearance of an important grazing animal, the black sea egg (Diadema Antillarum). Many of the fish caught in the reef fisheries are said to be grazing species which are instrumental in reducing excess algal growth. Therefore, their disappearance have caused an imbalance in the reef community in which algal growth is proliferated.. In elaborating on the extent to which algal growth could impact on the reefs, Goodbody posits the following view; "Algal growth could become so heavy as to smother the reefs and ultimately result in their decay followed by the erosion of the shoreline behind it". This commentary is reinforced when one considers that the destruction of the reefs in Port royal and Hellshire has intensified the erosion of the shoreline.

83
4) Pollution

Jamaica lies at the intersection of several tanker lanes and it is estimated that some 150 ships pass the island each week making the coastline particularly susceptible to oil spills. 4. Eleanor Jones reported traces of tar balls found on most of the south coast beaches and offshore cays in various concentrations.5.

Hendry (1982) reported that the reefs in Negril have been reduced by 78% 6. This mortality of coral reefs has been attributable to several land based activities such as dredging, careless deforestation of watersheds, sand mining and offshore sewage disposal. These landbased activities have contributed to high sediment load and turbidity in the nearshore waters, which encourages the proliferation of algal growth on the reefs.

The accumulation of large quantities of green sea weeds on the Hellshire beach and in the vicinity of the Kingston Harbour is attributable to the effects of sewage. Although coastal environmentalists agree that a small quantity of sewage has no significant effects on reef colonies they advocate that a large quantity can however, bring about a significant reduction in coral formation.

5. Collection.

Collection of coral for the curio trade is relatively common on the north coast. Although this activity is prohibited by law there is little enforcement.
6) **Natural Phenomena.**

Jamaica including a number of other countries in the region have recorded outbreaks of coral bleaching during 1987 and 1989. Environmentalists have attributed this phenomenon to the unusually long period of high seawater temperatures in the region (> 30°C for 4-5 months) and provides the basis for new concerns about the effects of global warming. The reefs mainly affected were fore-reefs of all varieties ranging from surface to more than 30m depths. It is said, that during the nine months of 1987-1988, the reef building corals failed to grow. It is felt that a repetition of such events would have far reaching consequences for the reef ecosystem and related reef based industries such as fisheries and tourism.

Similarly, Goodbody has reported evidence of extensive coral mortality at Half Moon Bay and elsewhere along the Hellshire coasts. Particularly affected was the elk-horn coral (*Acropora palmata*) which normally flourished near the reef crest. The possible cause of this event has been attributable to disease.

Another phenomenon which almost devastated the islands reefs was hurricane "Gilbert" in September, 1988. Prior to this event all types of corals flourished in the area but with the coming of the hurricane all types of branching and building coral were destroyed resulting from land run off and high sediment load which were deposited on the reef colonies.
What therefore are the consequences of destroying the reefs?

Chapter one outlined in detail some very important functions that the reefs perform. One of the main functions is the provision of habitat for the marine life. It follows therefore, that degradation threatens the way of life of a large percentage of the population who depend on reef fisheries for a livelihood. If we destroy the reefs which are the homes of our fish, the fish population will decline. Whereas, the average person may be unaware of the adverse effects of deforestation on our reefs, the average housewife is certainly aware of the rising price of fishes and would like the prices to decrease. According to the law of demand and supply, when demand exceeds supply the price of a commodity rises. It follows therefore, that the less fish there are, the higher will be the price of the fish. The destruction of our reefs therefore, contributes to a decrease in the standard of living of the population.

Recalling also it was stated that coral reefs form a breakwater for the adjacent coast therefore providing natural storm protection. Destroying the reefs is exposing the coasts to storm induced waves. The question can be asked which sane individual would deliberately leave his windows and doors open knowing that a storm is imminent? The answer is simple, no one. The destruction of our coral reefs is tantamount to a man leaving his windows and doors open during a storm. It is pointless for our coastal engineers to continue to erect sea defences with the objective of protecting the beaches while on the other hand conservationists confirm that these man made devices only alter the process of erosion for a while; or transfer the process further down the beach.

If the reefs are so important as natural wave breakers why
are they constantly being destroyed? The answer is ignorance compounded by a desperate quest for survival.

In the light of the above situation it is apparent that reef management is necessary for Jamaica. The need arises for an exploration of the agencies or institutions responsible for reef management in Jamaica with a view to understanding the policies which govern their operations so that possible modifications could be suggested.

3:2 **Agencies responsible for reef management in Jamaica.**

There is a complex array of laws relating to conservation and many agencies are concerned with their implementation. The following four organizations at present have some responsibility for reef management and monitoring:

a) The Caribbean Coastal Management Section of the Zoology Department of the University of the West Indies.

b) Discovery Bay Marine Laboratory which is an affiliate of the University of the West Indies.

c) The Port Royal Marine Laboratory.

d) The Natural Resources Conservation Department which is the designated government agency assigned this responsibility.

Objectively speaking, these organizations have to some extent done some work.

One recognizes the study done by the Caribbean Coastal
Management Department in assessing the status of the reefs along the Hellshire coast with the object of producing management guidelines for this section of the coast. Also, the study spearheaded by the Discovery Bay Marine Laboratory on the recovery of North coast reefs following hurricane "Allen" is also recognized. It is apparent that there is a real problem with reef management in Jamaica. Peter Bacon's observation with respect to reef management has some relevance in this context. He noted that at present only two small areas are designated Marine Parks and that little active management is carried out with respect to these sites.  

(Status of Environmental Assessment)

In a discussion with Mr. Leslie Wallen, Managing Director of the Montego Bay Marine, he projected a bleak future with respect to the coral reefs in the island. His words are worth repeating. "Coral reefs in Jamaica today are in a sad state; smashed by the hurricane, degraded by sedimentation, deprived of fishes and overgrown by algae. ....... It will be a long process to bring about any improvements in the large-scale problems of watershed management, pollution and overfishing and the Jamaican coastal environment is likely to remain suboptimal for coral reefs for many years". This is a sad commentary indeed.

With this situation becoming more compounded it is extremely necessary for the government to engineer an integrated coastal zone management which will address all the possible impacts on reef management.

The basis for management is derived to a large extent from
scientific research which involves obtaining information on the biological, ecological and geological processes involved in reef management. It is useful to learn about productivity, stress factor and tolerance, species distribution, food webs, nutrients and recycling. Only a good understanding of the system will permit effective utilization and management.

"Mangroves is a general term for various trees which can live in brackish water conditions and normally have their root systems in the water". (Goodbody, 1982). 10.

Approximately 30% of the Jamaican coastline is covered by mangroves and herbaceous swamps. 11.

The dawn of the 1980's has witnessed a massive destruction of mangroves in Jamaica. This phenomenon can be attributed to the following two main reasons:

1. The rapid development of Kingston and Other Areas in the Country.

2. The discovery of peat in the Negril and Black River Morasses.


Dr. Ivan Goodbody reported that the development of Kingston resulted in the destruction of 100 acres of interesting mangrove swamps at the entrance to Dawkins Pond in Kingston Harbour. 12. This area was important for the following reasons:

a) It was a major spawning ground for a number of species of fish and shrimp.

b) Unfortunately, this area also was the feeding ground for many hundreds of wading birds which nest in the Port Royal swamp and here was also the centre of the oyster industry.
It is unlikely, that this area will remain a spawning ground for fish in view of the fact that much of the Pond is being dredged for greater depth. This will definitely divert the flow of water to the sea. Can the society afford to destroy the mangroves?

Perhaps the most extensive loss of mangroves has occurred in the Portmore area adjacent to Kingston Harbour which was reclaimed to provide additional area for the development of residential housing.

Goodbody confirms that this activity together with the erection of the causeway linking Kingston and St. Catherine resulted in the destruction of one of the island's richest spawning grounds. 13.

Much concern has been expressed relative to the development of the former productive wetlands of Portmore. Today, this area now accommodates some 80,000 people whose homes are exposed to flooding from both sea and upland run off. Despite this reality, the government has recently announced plans to construct 10,000 low income houses in this area. This act will culminate in the final destruction of this prolific wetland area.

It is unfortunate that development has resulted and continues to result in the destruction of the fisheries habitat. Whereas, the government is striving to achieve one of it's policy objectives in providing homes for the populace, simultaneously, they are destroying a vital industry which is a source of livelihood for many artesinal fishermen and also a very important source of protein for a vast majority of the Jamaican population. It is ironic that we destroy our natural fisheries habitat to build houses in flood plain areas.
The warnings of the Meteorologists during the hurricane seasons is for the people of Portmore to evacuate the area prior to the hurricane. It is known that the area is a flood plain. Why therefore are the wetlands destroyed to support housing development? Little wonder that the area has been dubbed as the "Stationary time bomb".

The act of mangrove destruction is not confined to developments in the Kingston metropolitan region only. It can be recalled that the mangroves at the mouth of the Pye River delta in Montego Bay were cleared to construct 5000 units at the Catherine Hall housing scheme. Subsequent work to construct the Montego Bay Freeport has also resulted in the destruction of the fishery habitat around Bogue Island. As one poet puts it "man in his quest to build cities and construct roads has destroyed the beauty of nature".

It is known that many agricultural products have been sited on lands where mangroves and salt marshes once flourished. The Hague swamp near Falmouth was drained and the mangroves removed in 1977. The reclaimed land was used to establish a rice plantation.

Other activities such as dredging operations have also taken their toll on the mangroves. Dr. Goodbody has reported that the Mamee shoal in Kingston Harbour has been severely impacted upon by the dredging operations which took place in the Harbour in the late 1980's.

As the economic crises worsens in Jamaica, a vast majority of the population turns to the mangroves for economic support. In a number of areas such as Negril and Black River mangrove trees are cleared to provide wood for charcoal burning and for the production of dyes.
The Rastafarians in particular, are known for using mangroves to make broom sticks and for the construction of thatch houses from which souvenirs and local dishes are sold to tourists.

The bark of the red mangrove is used to prepare dyes and for the extraction of tanning.

3:1:B.2 The Discovery of Peat in the Negril and Black River Morasses.

The Great Morass (6000 acres) is the largest fresh water morass in Jamaica and constitutes together with the Black River Morass 75% of the total swamp area of the Country. (see figure 16)
It has an important filtering function for run-off from the surrounding land into the sea and is an important habitat for unique flora and fauna, (such as the swamp forest or fresh water shrimp). In addition to supporting these species, these wetlands have large deposits of peat which are being explored as an alternate source of energy.

Wetlands have recently become influenced by the population and have already been degraded. The partial degradation of these wetlands came into focus when the Jamaican government and energy sources decided to resort to peat mining as an alternate source of energy subsequent to the oil crisis of the 1970's. Dr. Perrot in the Sunday Gleaner, of June 24, 1984:8A, had forewarned that "the mining of peat would cause a major irreversible transformation of this eco-system and would be environmentally disastrous, technically experimental and economically unreasonable". As the saying goes, "To be forewarned is to be forearmed". Had this principle been applied, today the population would not be lamenting the destruction of a valuable possession.


In the late 1950's, the Negril Morass was channelized and drained. From the environmental protection point of view, the above activities could be considered the turning point in its current degradation as a wetland. The illicit cultivation activity has given rise to the creation of habitats for mosquitoes and sandflies and devastation of the swamp forests. See (figure 17) depicting the modern vegetation of the swamp forests.

The Black River developed as a fresh water wetland and has been the primary settling basin for matter transported by the Black River, the main water course connecting the Upper and Lower morasses.

Simultaneously, the Upper Morass functioned as a sink for nutrients which were absorbed on particles and assimilated by wetland plants.

The recently drained Upper Morass is now completely separated from the Black River by dykes and during the 1980's the former wetland was transformed mainly for the production of rice. The increased concentration of nutrients in the water drained from the upper Morass including all ongoing aquaculture and agricultural activities have now caused increased growth of water hyacinth.

Conservationists argue that prior to the dyking of the reach of Black River that passes the Upper morass, this wetland functioned as an important hydrological buffering basin and as a settling area for the load of clay and silt supplied by the river from the watershed upstream of the Morass. Today, the load of clay and silt is brought instead straight into the lower morass resulting in a further acceleration and down stream transgression of the levee formation. 14.

In the Black River Lower Morass shrimp fisheries are still of economic importance for the local population. In order to enable the shrimp to move from the river into the wetlands the fishermen dig out and keep channels open through the levees.
During flooding the levees are submerged but turbid and nutrient enriched river water is forced through the opening thereby causing changes in the vegetation. The overall effects of human activities is a destruction of the wetlands.

3.1. E. **Destruction of Seagrass Beds.**

Seagrass beds are extensive on sheltered sandy sea floors around Jamaica. These have been impacted due to oil pollution, dredging operations, industrial discharges and thermal effluent.

Anita Thorhaugh identifies the following two types of human disturbance to sea grass meadows in the Caribbean which are most harmful.

a) Acute disturbance frequently due to construction, dredging and filling or accidental spilling.

b) chronic low discharges or impacts. 15.

Chronic discharges usually involve sewage, industrial discharge, agricultural run-off, fertilizers, and urban run-off.

One of the most prevalent and most harmful sources of damage to seagrass has been dredging and filling for real estate development for construction of large waterfront industries. Marine dumping of the spoil associated with these activities are particularly harmful. Dredge and fill operations dredge up the sea grass directly and also fill on top of them. This contributes to turbidity.
In recognition of the destruction of seagrass beds in certain parts of the island in 1985 some attempts were made to colonize sea grass beds. Areas targeted were Port Esquivel (adjacent to the Old Harbour Power station and subject to thermal and oil pollution), Port Kaiser, a bauxite Port where seagrass beds were subject to smothering by spilled ore. In addition, several points in Kingston Harbour subjected to the effects of dredge and fill operations have been included.
Pollution.

Many definitions of marine pollution occur in scientific literature. The most widely used one however, seem to be the following: "The introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazard to human health, hindrance to marine activities including fisheries and other legitimate uses of the sea impairment of quality for use of sea water and reduction of amenities".16.

One can therefore use this definition of pollution and examine the following six types of waste disposed of in the coastal waters of Jamaica.

The deterioration and degradation of the island’s coastal waters are attributable to several sources of pollution both of marine and terrestrial origin. Jamaican environmentalists have confirmed that the major contributors to the pollution are the following:

a) The discharge of raw or partly treated sewage into the coastal waters.

b) Solid waste (municipal garbage)

c) Agricultural run-off from fertilized fields and from intensive stock raising.

d) Storm water run-off.

e) Industrial effluent.

f) Marine pollution. (Shipping related activities)
While there is not a comprehensive picture of pollution around the entire coast, information for Kingston Harbour is extensive and may accurately represent the situation in other areas. Accordingly, it is considered essential to present a brief overview of Kingston Harbour to set the stage for the ensuing discussion.


Kingston Harbour is a semi-enclosed bay which is situated on the south coast of Jamaica. It is bordered on the north-east and west by the mainland coast and on the south by the Palisadoes International Airport. (see figure 17)
The Kingston Harbour consists of three main regions: the inner and outer harbour and Hunts Bay. The latter averages about ten feet in depth. "It has a soft oozy bottom and is subject to considerable variations in salinity due to the influx of the Rio Cobre, Duhaney River and a drainage basin scheme, the Sandy Gully". It has been estimated that 662 square kilometres (256 square miles) of land drain directly into Hunts Bay while 52 square kilometres (20 sq.miles) drain directly into the inner harbour. 17.

Studies done on the Harbour reveals that on a daily basis the above bodies of water contribute approximately 2160 million gallons of sewage, industrial waste and agricultural run-off to the harbour. 18. This is a frightening situation.

To support the above discussion table three is used to show the estimated average flow from surface discharges.

<table>
<thead>
<tr>
<th>Name of Water Body</th>
<th>Mean Annual Flow Rate, (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rio Cobre River</td>
<td>219</td>
</tr>
<tr>
<td>Duhaney River</td>
<td>100</td>
</tr>
<tr>
<td>Sandy Gully</td>
<td>68.3</td>
</tr>
<tr>
<td>Gullies (North Shore)</td>
<td>60.7</td>
</tr>
</tbody>
</table>

Source: Doc. H: Silva
Having looked at the Kingston Harbour and its particular characteristics one can now proceed to discuss the major contributors to the pollution of the islands coastal and marine environments.

3:2. A Sewage

The largest single pollutant in Jamaica results from domestic sewage. In examining the extent to which sewage contributes to pollution in the island, the method of disposal, number and types of treatment plants and their capacities will be highlighted.

In a study captioned "Can The Kingston Harbour Be Saved" by Dr. Homero Silva indicated that approximately 13 million gallons of sewage is disposed of daily into the Kingston Harbour.

The sanitary domestic wastes in Kingston are disposed by different means. Approximately 18% of the urban population is served by sewerage system, 27% is served by individual septic tanks followed by soil absorption methods, while 47% use pit latrine and the rest do not have sanitary facilities.

In Spanish Town and the other towns within the Kingston Basin the amount of people served by sewerage system is minimal and most of them use septic tanks and latrines. It is clear that the eight percent of the population lacking sanitary facilities have no alternative but to dispose of their waste into gullies, bushes and along the banks of the river. Consequently, after heavy rainfalls the untreated waste is swept along by the river current and deposited into the coastal waters.
Table four shows the number of sewage plants by type and by parish.

### Table 4: Sewage Treatment Plants by Type and by Parish

<table>
<thead>
<tr>
<th>Parish</th>
<th>Sand</th>
<th>Filter</th>
<th>Trickling</th>
<th>Activated</th>
<th>Oxidation</th>
<th>Aerated</th>
<th>Oxidation</th>
<th>Rotation</th>
<th>Primary</th>
<th>Jiks</th>
<th>Plant</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>St. Thomas</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
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<td>1</td>
<td>-</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
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<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>St. Mary</td>
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<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>St. Ann</td>
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<td>-</td>
<td>-</td>
<td>9</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>14</td>
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<td>-</td>
<td>-</td>
<td>-</td>
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<td>Hanover</td>
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<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>Westmoreland</td>
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<td>-</td>
<td>-</td>
<td>4</td>
<td>1</td>
<td>-</td>
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<td>1</td>
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<td>-</td>
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<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Clarendon</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>-</td>
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<td>-</td>
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</tr>
<tr>
<td>St. Catherine</td>
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<td>11</td>
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<td>5</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>KSA</td>
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<td>-</td>
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<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1</td>
<td>4</td>
<td>62</td>
<td>12</td>
<td>6</td>
<td>17</td>
<td>1</td>
<td>6</td>
<td>109</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

102
As can be observed from the table there are 109 sewage treatment plants in the island of which eighty (80) treat domestic wastes, eighteen (18) treat hotel wastes, six (06) treat hospital wastes and four (04) treat combined sewage. Within the Kingston Basin there are thirty five (35) treatment plants. In the metropolitan area there are fifteen plants, five of which discharge to the Kingston Harbour via gullies while the other ten discharge into Hunts Bay via gullies. The other twenty plants discharge into the Rio Cobre which subsequently discharge into Hunts Bay.

With respect to the capacities of the plants Silva informed that the metropolitan area has a capacity of 15.7 MGD.22. These discharge 17,413 pounds of biological oxygen demand (BOD) per day. Of this amount, 15,439 goes directly into the harbour.23. It can be concluded therefore, that the Kingston Harbour acts as the big sink for waste in the coastal zone.

The foregoing data gave an insight with respect to the method of sewage disposal in Jamaica. It is however, known that the reasons for the pollution of the coastal waters by sewage are as follows:

a) The existing sewage treatment plants in the island are inadequate.

b) The assimilative capacities of the plants are exceeded.

c) The inadequate treatment of sewage and its disposal into the receiving waters has resulted in the pollution of the coastal waters.
The writer recalls the recent outbreak of typhoid fever in Westmoreland one of the parishes in the western end of the island. An investigation into the cause of the epidemic revealed that most if not all of the population in that town lacked sanitary facilities. Customarily their waste was deposited into the river. Simultaneously, the water was used for domestic consumption. The inevitable consequence was the outbreak of this disease. Following the incident the government decided to take action which reveals the crisis management approach of the authorities with respect to environmental matters. This is only one such case reported and there are several other villages lacking proper sanitary facilities.

With the growing urbanization, it is also evident that the demand for sewerage facilities will increase. The domestic sewage load from the urban centres is further compounded by the numerous resort hotels throughout the island which discharge untreated sewage close to bathing beaches. It is known that many of the hotels have package plants which are often over loaded or inadequately maintained.

Furthermore, in the north coast region of the island some of the sewerage outfalls are built in the top of cliffs which are discharged untreated into the coastal environment. This is a very dangerous action taking into consideration the devastating effects of sewerage on the coastal and marine environment and which will be examined at this point.

Domestic sewage dumped into a body of water is a potential hazard to human health, coastal resources and the marine environment. This is so owing to the fact that sewage contains pathogenic bacteria which are harmful to living
John Clarke contends that sewage dumped into a body of water adds to it large quantities of nutrients, unwanted bacteria and turbidity which produces basic changes in the ecological community concerned and results in eutrophication. This situation is not good for the aquatic marine animals.

Evidence continues to mount that chemicals from sewage are contributing heavily to the mortality of marine life in the island. A fish kill was reported in the Jamaica Daily Gleaner of May 3, 1988 by Wvolyn Gager. She reported a case of hundreds of dead marine life, including lobsters, shrimps, fish and fingerlings believed to have been poisoned by toxic substances.

Can Jamaica afford to totally deplete its fish stocks? In view of the fairly high dependence on fish protein, the country can ill-afford the destruction of this valuable resource therefore, immediate action is needed to arrest the trend towards destruction of marine life which is so essential to the maintenance of the marine ecological balance and to the sustenance of our people.

Apart from its destruction to marine life, sewage waste discharged into a body of water is a potential threat to human beings. The well known pathogenic bacteria and viruses contained in sewage can cause gastrointestinal and other infections such as hepatitis, cholera and typhoid. These ailments may arise from swimming or from eating seafood caught in contaminated sea water.

A few reports have been published connecting sewage
pollution to illness in the island. For example, in Kingston Harbour high bacterial levels were found along the entire north shore of the Harbour and fish kills have been associated with high bacteria concentration. 26.

Sewage is also dangerous to people coming in contact with the water. Water borne disease can be transported to wide cross sections of people consuming the water. The Westmoreland case attests to this fact.

It is apparent by now that the sewage disposal into the coastal and marine environment is a dangerous practice which needs to be urgently addressed. It appears that the issue at stake is to prevent rather than limit. It is impossible at this stage to return to the pristine surroundings of 5000 years ago but if the environment is to be rescued and resuscitated from the impending degradation then now is the time to act.

Of major concern is the fact that marine oriented tourism is particularly important for Jamaica. Deteriorating conditions of the beaches by domestic sewage reduce their desirability for tourists. Definitely this type of pollution is a threat to the fisheries and tourist industries.

The situation therefore, warrants the following actions:

a) The provision of adequate sewage treatment plants in the island.

b) To correctly site sewage outfalls.

In a discussion with M. Anderson a Marine Biologists of SERES Consultancy firm in aberdeen , Scotland, he informed that properly built sewage outfalls do not cause localised problems. He suggested that the method of separating the
industrial sewage from the heavy metal discharge could be explored.

There is an advantage in this method in that if the solid material is concentrated then the water lift can be discharged with little or no harm to the marine environment and the sludge used for agricultural purposes. This suggestion should be examined and by all possible means explored.

c) The acquisition of the necessary equipment and spare parts to keep the existing plants in good working condition.

3:2.B. Solid Waste Disposal (Garbage)

Another aggravating problem is the pollution of the coastal and marine environments from solid waste. The nearshore coastal waters of Jamaica continue to receive large amounts of garbage which enter the system from land run-off via gullies. The collection and disposal of garbage is an essential public service however, the observed procedures of solid waste disposal in the rural and urban areas are grossly inadequate. In fact, they represent an impediment to environmental quality and public health in the country.

The solid waste generated in the Kingston metropolitan area is disposed of mainly in two designated dump sites; the Riverton City and Lakes Pen. A third unauthorised disposal site is is located in the six miles Spanish Town area and a fourth, the Burtons dump.

The existing dump sites are selected more for convenience
than for suitability and constitute a major source of environmental problems. For example, the Riverton city houses a squatters residential community which virtually merges with the dump and neither one can be readily differentiated from the other. Because of this, the entire area appears as one large open dump. Fears have been expressed that this situation may result in a major epidemic in the island.

The Lakes Pen site more nearly approximates a sanitary land fill operation and is located away from any immediate residential area.

As regarding water pollution, both ground and surface waters are said to be adversely affected. The extent of ground water pollution is however unknown because of the lack of a ground water monitoring programme around the dumps.

This however, is not the case with pollution of surface water as some fish kills in the Hunts Bay area have been associated with pollutants arising from Riverton City and the illegal dump site at Six Miles. Monitoring done by the Environmental Control Division of the Ministry of Health indicates that the Duhaney River is adversely affected by leachate and run off from these dump sites. The Rio Cobre River has also been affected. It is worth remembering that both the Rio Cobre and Duhaney River discharge into the Hunts Bay which is a part of the Kingston Harbour.

The amount of garbage collected in the metropolitan area is estimated to be 5376 tons per week. It is further estimated that the collection service covers about 90% of the population. This seems plausible but when one considers the inconsistency in the collection of garbage it
negates the entire situation. In the Kingston metropolitan area garbage is collected at least twice per week however, quite frequently the trucks do not arrive and the garbage that was prepared for disposal is littered all over the city by animals. This ill-disposed of garbage accounts for a large amount of the floating garbage in Kingston harbour.

Also, in some parts of the island garbage collection is unknown. It is estimated that 77 tons of garbage are not collected. The uncollected garbage is disposed of mainly in open lots and gullies.

It is observed also, that street cleaners frequently sweep garbage into the drainage systems and during heavy rainfalls these are blocked resulting in the build up of water and flooding especially in the low lying areas.

Improved domestic waste processes will go a long way towards reducing the pollution of the coastal and marine environment.

It terms of corrective measure, it is recommended that the following actions be taken:

a) The careful selection and monitoring of landfills taking into consideration soil composition.

b) Compulsory burning of garbage in the rural areas under a control system.

c) Islandwide collection of garbage on a weekly basis.

d) The provision of reception facilities in public places.

e) The improper and unsanitary waste disposal sites to be abandoned and relocated. The fact is that their condition
is unsatisfactory and even if that was remedied their
location must remain an impediment to integrated management
which is so necessary for sustainability of the resources.
The only real way to improve the situation is to identify
new and appropriate sites.

f) Street cleaning to be kept out of drains.

g) A massive public education awareness campaign to
sensitise the population regarding the ill-effects of
improper garbage disposal.

Subsequent to effecting the above recommendations
consideration should be given to the revision of the anti­
quated and "toothless" laws governing solid waste disposal.

3:2.C. Agricultural Waste.

Rodriguez has categorized marine pollution from
agricultural activities as follows:

a) Inorganic fertilizers.

b) Pesticides.

c) liquid effluent containing high organic load from
industries such as sugar refineries and rum distilleries.

d) High silt content run-off resulting from poor soil
management practices.
Although data on the contribution of these sources to pollution in Jamaica is scarce there is evidence to suggest that pollution stemming from these activities is increasing. The inorganic fertilizers utilized in the wider Caribbean region are mainly nitrogen, phosphorous based compounds or potash.32.

Rainfall leaches these into rivers and coastal marine ecosystem which in turn leads to eutrophication of rivers and estuaries.33.

The persistent use of pesticides and herbicides from agricultural activities have also contributed to the pollution of the marine and coastal environment. In some locations they pose a serious and widespread threat to human and coastal ecosystem. Some of these pesticides enter the rivers through water run-off and marine life particularly, fish and shrimp have been known to ingest DDT and DDE compounds.

The article which appeared in the Jamaica Daily Gleaner of July 9, 1988, where Sylvia Lee made mention of the detection of pesticide residues in sweet peppers which were exported to the United States by Jamaican farmers; serves to reinforce the point that based on the indiscriminate use of pesticide not only aquatic animals are affected but human beings too, who unknowingly consume these toxic substances. This detection of the pesticides residue was due to the high level of technology in the importing country. Conversely, in the local situation such a detection is unheard of, hence one can ponder the many times that locals unknowingly consume these deadly poisons and also how carelessly these pollutants are dispersed into the environment.
The main source of the organic load from agriculture comes from the sugar and rum industries in Jamaica. Effluent generated by these industries are discharged directly into the coastal waters and cause algal blooms. These by reducing oxygen supply, often result in large fish kills.

Total control of such pesticides as DDT and others will be difficult because they are used in Jamaica to control insect carriers such as malaria or for crop control. There is no real substitute for them as yet. However, in terms of their use the government needs to take steps to develop and monitor their use in areas of potential contamination to assess the concentration level.


The direct results of storm water run off are the floating garbage in the Kingston Harbour and other nearshore coastal waters. It is incredible to assume that such a quantity of garbage was dumped on the land. The source of this waste is the accumulated garbage disposed of, in gullies by citizens.

Subsequent to hurricane Gilbert in September 1988, objects as large as derelic motor cars and cycles were seen floating in the Kingston Harbour and adjacent gullies. This situation again reinforces the need for proper garbage disposal sites in the country.
3:2.E  Marine Pollution.

Recent studies done on oil pollution in Jamaica have identified the following two basic contributors:

1) Occasional or large accidental discharge from shore side facilities or vessels and ;

2) The mundane or daily operational activities.

Source two is felt to be the greatest contributor of oil in the Kingston Harbour and probably the most damaging for the environment. Examples of such sources are the corroded fuel line on a dock that is allowed to continue leaking or the harbour vessels which routinely pump their oily bilge water over the side. Another source of pollution is the frequent release of oil into street drains and gutters by the automobile owner or service station owner after changing the oil in the car.

Another is the industrial equipment cleaning stations which allow oily waste water to simply run off without proper traps and safe guards.

Studies of the Tanker traffic studies of the Caribbean show that a number of major tanker routes pass close to the coast of Jamaica with the attendant risk of pollution from accidents. 34. (Valrie Gordon).

Based on historical records Jamaica has experienced approximately 3-4 spills minor spills. The most recent was a spill of 200 barrels of oil in Port Esquivel arising from a broken pipeline.
Although the island has been spared from devastating spills of the magnitude of the recent Exxon Valdez, this does not give any reason for us to be unprepared for a major accident.

An examination of the existing oil contingency plan in Jamaica, by the writer, has revealed that it is very limited in scope. As a matter of fact, the plan does not clearly define the specific task for the Jamaica Defence Force and the Natural Resources Conservation Department for minor or operational skills and one foresees difficulties and bureaucratic bungling in the event of a major oil spill. It is therefore imperative for the authorities to re-examine the plan with a view to reconciling the shortcomings.

Another very important concern is the fact that Jamaica has not ratified the 1969 International Convention on Civil Liability for Oil Pollution Damage or the Fund Convention which offer protection in the event of a major spill. In recognition of this situation the writer strongly urges the Maritime administration to immediately take the necessary steps to ratify these conventions.
<table>
<thead>
<tr>
<th>Industry</th>
<th>Est. Flow</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft Drink Bottling</td>
<td>225,000</td>
<td>High pH, S. S.; BOD</td>
</tr>
<tr>
<td>Vegetable and Fruit Canning</td>
<td>210,000</td>
<td>High S.S. and Dissolved BOD</td>
</tr>
<tr>
<td>Slaughterhouse</td>
<td>90,000</td>
<td>High BOD, Proteins, fats</td>
</tr>
<tr>
<td>Dairy Products</td>
<td>200,000</td>
<td>High BOD, proteins, fats and lactose</td>
</tr>
<tr>
<td>Brewery</td>
<td>700,000</td>
<td>High Dissolved BOD, N, and starches</td>
</tr>
<tr>
<td>Tannery</td>
<td>30,000</td>
<td>High solids, hardeners, salt, pH, BOD</td>
</tr>
<tr>
<td>Oil Refinery</td>
<td>400,000</td>
<td>High BOD, Phenols, oil, etc.</td>
</tr>
<tr>
<td>Detergents, Oils, and soaps</td>
<td>250,000</td>
<td>High BOD and saponified soaps</td>
</tr>
<tr>
<td>Citrus Processing Plant</td>
<td>1,500,000</td>
<td>High Volume of Acid, BOD 138-232 mg/l</td>
</tr>
<tr>
<td>Sugar Factory</td>
<td>6,210,000</td>
<td>Cooling water, House Keeping, slop</td>
</tr>
<tr>
<td>Milk Condensery</td>
<td>2,000,000</td>
<td>High SS and BOD, heavy black sludge</td>
</tr>
<tr>
<td>Alumina</td>
<td></td>
<td>With acid odor, BOD 59 to 135 mg/l</td>
</tr>
<tr>
<td>Total Estimated Flow</td>
<td>111,815,000</td>
<td>Total BOD 10,229 lb BOD/Day</td>
</tr>
</tbody>
</table>

The discharge of industrial effluent into the coastal and marine environment has been linked to several key industries in the country which pollute in one way or another the Kingston Harbour and other bodies of water. Table five presents a partial list of these industries.
Some of them discharge their effluent directly into the Harbour, for example, the Petrojam Refinery, the Abbatoir, the Cement Company and the ethanol plant. While others discharge their effluent into gullies and rivers which later discharge into the Harbour.

Further analysis of the table indicates that the waste disposed of by the industries are characterized by high biological oxygen Demand (BOD), chemical oxygen demand (COD) and highly toxic substances which are known to be detrimental to the coastal and marine habitats. From this table, it is estimated that 11.8 mgd of industrial waste water is discharged into the Kingston Harbour basin with a total BOD load of 10,230 lbs/per day. (Adapted from Dr. Homero Silva, Environmental Control Division) 36.

To a significant extent, the above situation has resulted in the destruction of all forms of benthic life in the Kingston Harbour. Dr. Goodbody has lamented the consequences owing to the fact that the harbour was a formerly a prolific fishing area and the foundation of the oyster trade. The situation is not solely confined to Kingston Harbour; it extends to many other coastal and inland bodies of water.

In the inland rural areas too, untreated effluent from food processing plants, animal waste and agricultural chemicals which empty into a number of rivers have caused a marked reduction in the productivity of these systems and the nearshore waters into which they drain. Notable examples are the Cabarita River in Westmoreland which is affected by sugar cane dunder, and the Rio Cobre which is polluted by beverage and citrus producing plants in Bog Walk. 37.
At present, monitoring of the effluent is not being done by the individual industries except by a few such as Shell Company West who subsequent to an environmental audit in 1990 has employed a full time environmentalist and has put in place a five year programme of corrective work. The decision of this Company to introduce unleaded fuel and also use liquid petroleum gas as a propellant in their aerosol insecticides is commendable. By doing so they are decisting from contributing to the massive ozone depletion that is now taking place.

It is worth mentioning also that Alcan Jamaica Company is employing methods such as dust collection for alumina and use of dry mud stacking system as preventative measures against environmental degradation.

It is the researchers view however, that in the absence of adequate legislation, the government can only seek the voluntary cooperation of the industries in addressing the issue on a short term basis.

There is the need for the balance sheet of the industries to truly reflect the social cost of production. These industries boast large profit margins each year but have they ever stopped to think of the cost of their operations to society. The price of their product should not only include the cost of production which are calculated by private companies. Such cost should incorporate the true cost to society, such as the cost of related health care to communities exposed to their toxic waste. Knowingly, if these industries had to bear the full social cost of production indeed they would apply prudence in the use of resources thereby reducing waste to a minimum.
Admittedly, the operations of the industries have impacted negatively on the coastal environment. While the industries are important to the economy of the country, their operations should not be conducted at the expense of the marine resources. The poor fishermen are forced to go to bed hungry while these managers live in luxury. This is unfair. The situation necessitates the implementation of strict and harsh measures to reverse this trend. Certainly, the prevailing situation does not lend itself to the achievement of sustainable development.

Therefore, in the light of the above it is recommended that for the longer term the following should be effected:

1. The establishment of an environmental fund where the different industries should be required by law to contribute.

2. Part of the carelessness on the part of the industries is attributable to lax laws. On the strength of this, the government urgently needs to institute laws regulating emissions and imposing stricter and harsher penalties to offenders.

3. Establishment of guidelines and effluent discharge standards for the various categories of industrial waste.

4. The development of legal and institutional mechanisms for effective environmental management in the industrial sector.

5. To encourage environmentally friendly industries by granting tax incentives for good housekeeping.

6. To work in close collaboration with the United Nations Environmental Programme (UNEP) in their Regional Seas programme to strengthen local organizations in their monitoring of pollution levels.
Quantitative analysis shows that shoreline erosion has severe impacts throughout the Jamaican coastline. The factors contributing to erosion have been highlighted as natural, such as tidal and wave action, man made, which includes the illegal mining of sand and corals, and the construction of groins, jetties and sea walls along the shoreline.

The removal of sand from beaches in Jamaica is a well established practice. Sand is frequently mined on beaches and sold for use in the construction industries. Jamaican Conservationists have argued that sand mining is induced erosion and they have shown where the illegal removal of sand has resulted in beach erosion which caused serious problems particularly in Johnson Town, Hanover, Hope Wharf in Westmoreland and Rose Hall, in St James.

The erection of protective structures such as sea walls and groynes which have been built in inappropriate places have also contributed to beach erosion. Gillian Chambers contends that, it is only when a coastline is developed that erosion constitutes a major problem and cautioned that the fundamental concept that coastlines are constantly changing should be considered before development begins. (Gillian Chambers, Cariabiana).37. This warning should be seriously considered by the Jamaican planners and developers prior to any future development planning.
Another factor contributing to coastal erosion is the human pressures on the beach vegetation. In a study done on the Hellshire Coast, Dr. Goodbody reported that excessive human pressure has destroyed the beach vegetation thereby resulting in wind driven transport of sand along the beach. He further noted that the erection of the small buildings, stalls for fish and vendors, craft workers and supporting services for water sports additionally damage the vegetation cover and further enhance the rate of removal of sand.

The erosion of the beaches will impact significantly on the tourism industry because the beaches are one of Jamaica's finest natural resources for tourists. Also, the excessive spill over of sediment into the marine environment is known to contribute to the mortality of many of the near shore reefs. Figure 18 shows where critical beach erosion has taken place.

**AREAS OF CRITICAL BEACH EROSION**

![Diagram showing areas of critical beach erosion in Jamaica.](image-url)
It is imperative, therefore, that appropriate and suitable technologies to counter beach erosion be effected in order to prevent the further encroachment of the sea on the land. For the future the following proposals should be considered:


Complete prevention of the pressure short of denying or severely limiting human access to the beaches is probably impossible but areas showing the worst effects can be rested through the use of fencing and can be reseeded and the problem can be greatly reduced by the construction of footpaths. These footpaths channelling access to the adjacent beach can be floored by wooden board or by resistant turf.

3:4.2. Coastal Setback Lines.

It seems also that the best solution would be to pull development activities from the coast in order to prevent erosion. This could be done with the government planners establishing set back lines as a corrective measure to prevent further erosion.

a) Definition of Coastal setback lines.

The above lines are surveyed lines that define the seaward limits of construction activity along the land portion of the coast. The location of these lines is based on scientific criterion which takes into account dynamic features such as waves, tides, storm surges, erosion rates as well as topographic features such as dune elevation, beach slope and beach material.
The purpose of setback lines is two-fold:

a) They are intended to ensure that beach erosion is not triggered or accelerated as a result of coastal construction activity which interferes with beach processes;

b) They serve as a form of protection for building construction for example, housing, roads or plantation by locating them away from the zone of probable worst case erosion.

Once the setback line has been adopted it should be enforced. A series of surveyors concrete monuments should be established along the beach and maps showing the location of each monument should be prepared and referred to in future development planning.

3) Also, it is proposed to put in place a system of zoning in which certain areas are set aside for one major purpose and others given over to different activities. This system would serve to limit high population concentration in areas where erosion would be the result. Care should however, be exercised in deciding which areas should be devoted to which purpose. The whole object of the zone management is to prevent and regulate.
The coastal reef fisheries of Jamaica are known to be at the stage of their development where the resources are overfished and in need of management. Estimates have revealed that since 1975/1976 the fisheries have entered a phase of over-exploitation characterized by declining catch rate. For example, although the fishing effort increased significantly between 1968 and 1981, the total catch remain at approximately 7000 tons per annum. Since 1982 there has been no significant change in fish production. Fish production has remained between 18 and 20 million pounds. Munro 1974 noted that the North coast reefs are more impacted upon due to their narrow submarine shelf.

This phenomenon has several implications for Jamaica. Firstly, it is an established fact that overfishing will lead to the population collapse of the target species. Despite this the sad conclusion from Berkes is that a common stock not in effect owned by a human community or individual will be overfished. Increasing effort will be applied to the stock until the sustainable capacity is exceeded. If the fishing is a matter of subsistence where there is no alternative source of dietary protein. There will be continued and increasing application of efforts until the collapse is so complete that the stock is destroyed.

Another concern is that a depleting stock will escalate the price of fish on the market thereby depriving the poorer class of people in the society of this essential protein which is so important to their diets.
Declining fish catch also means that the import bill for fish will escalate. Jamaica at present imports a significant proportion of fish both tinned and salted therefore a declining fish catch will further push up the import bill.

Marine fisheries in Jamaica are in general terms referred to as common property. They are owned by no one and belong to every one. As the mounting pressure of unemployment increases, many people turn to the sea for a livelihood. Perhaps the words of Munro, et al, adequately reflect the situation. He pointed out that where fishing communities are faced with a desperate fight for survival the living resources are likely to be overexploited by subsistence fishing. He further added that in such a situation, as the catch with conventional methods declines, more and more destructive fishing techniques such as dynamite, poisons and muro ami are used to increase the catch. 45. This observation adequately reflects the situation in question.

The depletion of the fish stock in Jamaica is attributable to the following factors:

a) The destruction of coastal mangroves, wetland areas and sea grass beds which provide breeding, feeding and nursery grounds for fish and shrimps.

b) Illegal and destructive fishing techniques which include the use of chemicals and dynamite to catch fish.

c) Reef destruction.

d) The pollution of harbours and nearshore water bodies.
e) Ineffective legislation.

In Jamaica there is no proper system of fisheries management and this has in part contributed to the depletion of the fish stocks.

e) Poor fishing techniques in which fine mesh are used to trap juvenile fish

Summary.

The declining fish catch means that the living standards of fishermen has been drastically reduced. Future trends indicate that if suitable managerial measures are not implemented the decline in the fisheries will reach crisis proportion. There is therefore an urgent need for the development and implementation of appropriate management measures designed towards the sustainable exploitation and preservation of the stocks.

The following measures are proposed:

B) The development of adequate supportive infrastructure such as landing areas, boat repair and storage facilities in the prominent fishing areas along the coast.

In terms of administrative capability there is the need to strengthen the institutional capability of the Ministry of Agriculture Fisheries division by providing the necessary financial, human and mechanical resources.

Human Resources.

a) There is the need to employ qualified and trained
personnel such as marine biologists, fisheries inspectors and legal officers to regulate fisheries operation.

b) Development of a data base such as a computerized system which would record and store the licenses delivered to national and foreigners, the fish stock, fishing grounds, number and types of boats, as well as sustainable yields which would facilitate forecasting and the controlling of stocks.

Mechanical Resources.

In terms of mechanical resources the following should be provided:

1) Fishing patrol vessels such as high speed boats to pursue offenders. These boats should be equipped with radio communication systems.

2) Aerial surveillance at least two flights per week utilizing the aerial resources of the army. The object of such operations would be to identify the vessels in the different fishing zones and also to spot illegal foreign fishing vessels.

Legislations:

There is the need to effect adequate legislation to regulate the following:

1. Each fisherman should be restricted to a minimum catch. They should travel with a log book which records their catch and which the fisheries inspectors should inspect.

2. Landing control.
Inspectors should be posted at each landing port to control
the total landing catches, the minimum landing sizes and to control the non landing of protected species.

3. Steps should also be taken to put in place the necessary legislation as regards the methods of fishing and dimension of mesh size.

4) The establishment of protected areas designed to rebuild the stock.

c) Registration and licensing of fishermen thereby limiting the number of fishermen entering the market.

d) Total Allowable Catch Systems.
3:6. The Concept of Sustainable Development.

Is Development within the Jamaican coastal zone sustainable?

One having examined a multiplicity of outcome problems associated with development within the Jamaican coastal zone one may proceed to ask the question: Is development within the Jamaican coastal zone sustainable? Any answer to this question necessitates a look into the sustainable development concept and what it entails and what should be done at this point.

In view of the development of the globalization of environmental problems, the United Nations in 1982 established a World Commission on Environment and Development. The Commission was mandated to provide long term environmental strategies for sustainable development and additionally; to recommend means by which global concern for the environment could be translated into cooperation between countries. 46. (Our Common Future)

The Bruntland Commission in its report defined sustainable development as "Development that meets the needs of the future without compromising the ability of future generations to meet their own needs". "Sustainable development is not a fixed state of harmony but rather a process of change in which the exploitation of resources, the direction of investment, the orientation of technological development and institutional change are made consistent with future as well as present needs. (UNCED 1987. Our Common Future, page 8.).
The concept of sustainable development places most of its emphasis on the prudent use of resources to ensure their availability to future generations. It is regarded as a concept which allows economic development along paths that are ecologically and socially sustainable.

The sustainability concept by its very nature requires the integration of activities at all levels including the international level. It also embodies the idea of a balance between technology and resources and an even balance between the use of one resource and another. In this vein one may be tempted to ask whether there is a balance between the use of land based and marine resources in Jamaica. Chapter two highlighted the multiple use conflicts among the various resource use and the attendant destruction of the fragile coastal and marine resources due to uncoordinated and unintegrated exploitation.

To a large extent the focus of the government has been on such sectors as tourism, agriculture, and bauxite mining while marine resource use has been virtually ignored. An interesting argument put forward by conservationists is that there are no votes on the high seas. This is a reasonable argument. The inability of the marine animals to protect themselves has led to the partial destruction of their habitats.

Already the destruction of our reefs coupled with overfishing has led to the depletion of our fish stocks. The livelihood of our fishermen has been threatened and a significant number of them are now unemployed. Are our policy makers aware of this? Certainly this cannot be considered to be sustainable management.
The trend of environmental degradation is also seriously impacting on the fisheries and tourism industries. Already pollution and destruction of coastal nursery grounds combined with overfishing have significantly reduced the catch of many important commercial species and reef grazers. Sand mining is also contributing to erosion of the shoreline thereby reducing the touristically useable land. The development of harbours is impacting negatively on the living resources of the ocean and the washing of ballast tanks by tankers in the area designated high seas in the Caribbean sea. In addition the indiscriminate disposal of untreated sewage, solid waste, and pesticide residue into the coastal environment is also contributing to its degradation. This cannot be considered as sustainable development. The Food and Agricultural Council in their definition of sustainable development purports that "Such development conserves land, water, plant and genetic resources and is environmentally non degrading, technologically appropriate, economically viable and socially acceptable". 47.

It is the widespread view in Jamaica that little attention was paid in the past to the deleterious effects of development on the coastal and marine environment. The situation is very striking when one considers that approximately three quarters of the entire Caribbean region is sea. In this light it must be recognized that Jamaica with its 200 miles EEZ has a far greater marine expanse than land area under its Jurisdiction. UNCLOS 3 is most innovative in the area of addressing practices relating to the protection and conservation of the coastal and marine environments. As a matter of fact, one recalls that, that system was devised in recognition of the interactions between the uses of the ocean.
As a signatory to the Law of the Sea Convention (UNCLOS 3, 1982) and in accordance with Article 192 which states that "all nations have an obligation to protect and preserve the marine environment" the mounting evidences of pollution within the coastal waters clearly indicates that Jamaica is not honouring it's commitment.

It should also be noted that Article 212 accords to coastal states the right to implement preventative and control measures in the territorial sea, the EEZ and the contiguous zone in order to reduce the pollution of the marine environment. In the light of this it cannot be overemphasized that Jamaica is obligated to establish national laws and regulations to prevent and control pollution of the marine and coastal environment from dumping and other land based sources. The acute pollution problem in the island is enough evidence to assert that development is unsustainable. The question which has to be asked is, what is Jamaica doing in light of the widespread environmental degradation?

The response of the government has been weak or non existent with respect to preservation of the nations health and enforcement of environmental protection laws. The government has not adequately implemented and enforced laws regulating waste disposal. Consequently, most of the waste is disposed of in a manner that ultimately threatens the health of citizens and marine life, thus Jamaica continues to sow the seeds of its own destruction.
If the succeeding generation is to inhabit a world that is environmentally secure, economically prosperous and characterized by growing peace, freedom and human welfare then the current generations must come to grips with the underlying trends that threaten to make these problems far worse. The heavy discounting of the resources clearly attests to the fact that if the trend is not reversed certainly the future generation will not inherit any stock of wealth. For economic development to be sustainable it cannot neglect environmental constraints nor be based on the destruction of natural resources.

Summary.

From the analysis presented in this chapter it can be concluded that development within the Jamaican coastal zone is unsustainable. This being the case therefore, what management tools should be in place to ensure sustainability? The question is answered in chapter four in which a suitable management concept for Jamaica is recommended.
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Chapter Four.

Management Of The Coastal Zone.

Conceptual Aspects Of Coastal Zone Management.

In the preceding chapter it was emphasized that for development to be sustainable it cannot neglect environmental constraints nor be based on the destruction of the natural resources. It was further asserted that attainment of the sustainable goal will require transformation of the existing institutional arrangements and resource base as well as the whole approach to government.

The writer having thus concluded that development within the Jamaican coastal zone is unsustainable, the task that immediately presents itself is how to propose a suitable and appropriate management strategy geared towards this end. This is the focus of this chapter.

This chapter is divided into four sections:

1) Section one discusses the theoretical notions and provides a conceptual and normative framework for coastal zone management in Jamaica. It is also to be understood that the concept of integrated coastal zone management should not be viewed only as a theoretical framework but as a management tool directed towards the achievement of sustainable development in Jamaica.

2) Section two is a brief historical review of coastal zone management in Jamaica. This section is entitled "The genesis of Coastal Zone Management in Jamaica".
3) Section three is captioned "The Partial Exodus".

4) the last section is entitled" Picking Up The pieces". It reviews current initiatives toward coastal zone management in Jamaica.

4:1. The Concept of Coastal Zone Management.

There are many aspects to coastal zone management. In this section an attempt is made to discuss and present some of underlying perceptions of coastal zone management with a view to adopting one of these as a proposed management tool for integrated coastal zone management in Jamaica.

Current approaches to coastal zone management emphasize such concepts as integrated management, conflict management, sustainable resource exploitation, controlling resource use, preservation of coastal resource and coastal area planning. Many people however, agree that the major concern should be centered on resolving conflicts among coastal uses, mitigating ensuing impacts and determining the most appropriate use of resources which warrants serious attention when an approach to management is considered in this particular context.

Other definitions of coastal zone management are confined solely to the resolution of conflicts arising from the variety of coastal uses. This type of management requires an integrated approach because of the variety of uses.

Sorensen, et al, discuss the replacement of the term coastal zone management with integrated coastal resource management.1 An important component of virtually all definitions of coastal zone management however, seems to be resource optimization and preservation.
Lawrence Hilderbrand contends that there are two components to this concept; coastal zone and management. He views this concept from a planning and management perspective. In his definition of planning, he rationalizes the concept as "A process designed to inter-relate and jointly guide the activities of two or more sectors in planning and development".

He highlighted the goals of integrated planning as "the preparation of a comprehensive plan which specifies the means to effectively balance environmental protection, public use and economic development to achieve the optimum benefits for all concerned".

This definition recognizes integrated planning as a means of co-relating multiple activities in developmental policies.

Hilderbrand also defined management. He perceives this concept as "a process of implementing a plan designed to resolve conflicts among a variety of coastal users to determine the most appropriate use of coastal resources and to allocate uses and resources among legitimate stakeholders". In combining both components, Hilderbrand argued that coastal zone management in its broadest sense includes ocean management since the coastal zone may extend from the upper limits of the coastal watersheds to the outer limits of ocean jurisdiction. This definition absolutely expresses what management is all about.

An alternate view of the concept under consideration is presented by David Fisher. He argued that coastal zone management means many different things to different parties involved in activities that impact on the coastal area.
He argued that the developers concept of coastal zone management would be different from the existing residents or the engineers. To a coastal engineer, Fisher said, coastal zone management may mean the planning, construction, monitoring and maintenance of works of coastal defence; while to a planner it may mean the control of development and usage of the coastal zone.

To a conservationist, he said, it may mean opposition to the construction of coastal works. From the developers point of view, he asserts, that additional structures on the coast is improving management among other things. To the existing resident, he noted that the erection of structures mean a loss in management capabilities. To the scientist, he observed that the natural coast is a haven for his work and he often becomes frustrated over development and engineering solutions to coastal management. Fisher concluded that coastal zone management is "an open ended concept."

It is strongly felt that this argument has a lot of merit. The resulting diversities of perceptions do not make coherent discussions easy and the diversity of actual situations make generalizations dangerous. Therefore, coastal zone management in this context remains a difficult, confusing and even controversial idea.

One of the problems is that coastal zone management is a broad new field. The formal discipline is less than two decades old. Because of this there is no universal agreement on which management programme should be addressed.
Under these conflicting philosophies coastal zone management cannot be translated into an effective planning mechanism. Therefore, one realizes the difficulties involved in harmonising and translating the above philosophies into effective management. This could very well be the reason why integrated coastal zone management remains a nightmare in Jamaica.

The concept of coastal zone management as expressed by Sorensen, et al, is defined as "Any governmental programme established for the purpose of utilizing or conserving a coastal resource or environment". 7. In the broadest of terms, he goes on to say that "It is intended to include all types of governmental institutions in a society". Use of the term implies that the governmental unit administering the programme has distinguished a coastal zone as a geographic area apart from-yet-between the ocean domain and the terrestrial interior domain. The resources and/or environments being managed define the geographic extent of the coastal area or zone".8.

This is a comprehensive and all embracing concept of all the elements which are to be contained in any coastal zone management programme. In this regard, Lawrence Hilderbrand included the seaward component as an area for management and which should be included in any programme for integrated coastal zone management.

One of the obstacles to integrated management is that some of the governments try to devise land management programmes without including the ocean domain as outlined by the United Nations Law of the Sea Convention for management. It can be said that coastal zone management goes beyond the "traditional yet important subjects of shore land zoning, wetlands management and beach access". (Hershman 1987) 9.
Although Jamaica has extended its maritime jurisdiction to 200 miles seaward of the shoreline there is no comprehensive management programme designed to effectively manage this area. This concern therefore, needs to be addressed prior to any attempt to coastal zone management.

Implicit also in the above definition is the idea that the management programme functions as a result of an initiated policy framework promulgated from a governmental level and consistent with it's goal for the development of the country as a whole.

Sorensen, et al, have also focused on coastal zone management as an evolutionary process which is developed from a concept to an institutionalized programme. 10. The process must address itself to the following eight stages.

a. Stage 1 - Incipient Awareness.

b. Stage 2 - Growing awareness.

c. Stage 3 - National Study.

d. Stage 4 - New Programme Creation.

e. Stage 5 - Programme Development / plans / Policies.

f. Stage 6 - Programme implementation.

g. Stage 7 - Programme Assessment.

h. Stage 8 - Programme Institutionalized.
Translating this evolutionary process into programmes and polices in Jamaica has proved to be a difficult task. Objectively speaking, one can say that Jamaica is currently at stage four. History has shown that the country has never succeeded in going beyond that stage. Sorensen et al further noted that such a programme has continuity over time and it is not a one time project. 11.

The immediate and foremost task facing the country is to establish programmes geared toward arriving at the final stage of this evolutionary process and maintaining continuity over time. It is perceived that the key to the achievement of this developmental goal is the recognition of the inter-connectedness of all the coastal uses and hence the planning and management of the coastal zone in a comprehensive fashion.

The organized process of integrated coastal zone management as an effort is characterized by several attributes. Sorensen, et al, identified the following six attributes.12.

1. It is initiated by government in response to issues— usually resource degradation, exposure to coastal hazards multiple use conflicts, or socio-economic development needs.

2. The effort has continuity over time it is not a one time project.

3. There is a governance arrangement to establish the policies for making allocation decisions and if the programme is implemented, a governance arrangement for making allocation decisions.
4. The governance arrangement uses one or more management strategies to rationalize and systemize the allocation decisions.

5. The management strategies selected are based on a system perspective which recognizes the interconnections among coastal environmental systems as well as public services systems. The systems perspective usually requires that the design and implementation of management strategies be done as a multi-sectoral effort.

6. It has a geographic boundary that defines a space which extends from the ocean environment across the transnational shore environment.

With regard to this final attribute, Sorensen argue, that some small islands can be designated coastal zones. This observation is applicable to Jamaica which is a small island nation whose coast is within easy access from any part of the country. (See figure 4)

Sorensen, et al., concluded that in most cases the fifth and sixth attributes serve to distinguish coastal management programmes from other efforts to manage coastal resources or environment. In other words if a country has defined a coastal area and is planning it from a systems perspectives the other four attributes will be present.

This theoretical review by Sorensen, et al., provides the justification and framework for the integrated coastal zone management programme which will be proposed for Jamaica. This discussion will be developed in chapter six subsequent to a review of the strategies pursued by the various actors in the planning process over the years relative to coastal zone management.
Environmental management in Jamaica had its beginning in the expressed commitment to environmental management stated first at the 1972 Stockholm Conference. In keeping with its commitment to environmental management as expressed at the Conference, the government initiated the formation of a number of Ministries tasked with the responsibility for environmental matters:

Amongst these creations were the Ministry of Mining, the Natural Resources Conservation Department (NRCD) and the Natural Resources Conservation Authority (NRCA).

The Ministry of Mining and Natural resources (1974), was assigned the responsibility for mineral resource mining, geological mapping and mineral resource exploitation, development and conservation of water resources, distribution of water, land planning and registration.

Also included in its mandate was the responsibility for coordinating the activities of the existing bodies whose functions impinged on environmental matters. These bodies were: The Beach Control Authority, Kingston Harbour Monitoring Committee, National Parks and Wildlife Committee and the Department of Public Recreational facilities.

The second event which engineered a concerted effort towards the development of a coordinated approach to environmental matters was the proposal of a United States multinational Corporation to site an industrial complex in the island in 1974.
Recognizing the deleterious environmental effect of this project, the government created the Natural Resources Conservation Department and the Environmental Control Department in 1975 with administrative and legal capabilities to address any environmental problems resulting from this operation.

Further efforts towards environmental management resulted in the creation of another new organization, the Natural Resources Conservation Authority which was assigned the responsibility for directing the workings of the NRCD. In addition, the new entity was intended to unite existing bodies with responsibilities for environmental matters such as the Beach Control Authority, Kingston Harbour Quality Monitoring Committee, Watersheds Protections Committee among others.

A subsequent function pertained to ecological research and natural areas management was assigned to the NRCD:

4.3. The Partial Exodus.

The creation of the NRCD was short lived. Overcome by economic events and problems in the 1970’s (when the country experienced severe fiscal problems, followed by years of economic decline, due to rapid increases in the price of oil and stagnating productivity in most sectors) the movement towards environmental management lost momentum.

Faced with this situation, the government focused it’s attention on a structural adjustment programme geared towards the achievement of short term goals. Emphasis was placed on the development of economic policies with little regard for the impact of development on the environment.
The inevitable result was the demotion of the NRCD in 1987 to divisional status. Thus the Agency was relegated to a state in which it was considered to be a "toothless bulldog". It had little or no controlling or coordinating functions concerning the activities administered by the multiplicity of governmental agencies under its purview.

Plagued by high staff turnover, starved of funds and unable to recruit trained and qualified staff, it became virtually non-existent.

The NRCA was likewise affected. In the 1970's it too lost it's function.

4.4. Picking Up The Pieces.

In light of the existing degradation of the coastal and marine environments of Jamaica, the government has decided to adopt a pro-business approach to environmental matters. The growing awareness of the ecological implications of degradation, destruction and multiple use conflicts taking place in the country have provided sufficient incentives for the government to decide to accord high priority to environmental matters.

As Sorensen, et al, posit, some threshold of resource degradation, natural hazard destruction or conflict has to be reached before the government takes action. 13. This is a true reflection of the motive that has propelled the Jamaican government to take a serious look into environmental matters.
The Prime Minister expresses the situation quite clearly in the following words. "Jamaica's environmental problems may be categorized in the areas of: watershed degradation, soil erosion, pollution of water resources, destruction of wild life and habitat, coastal and marine degradation, and increasing deficiencies of urban infrastructure. Jamaica is also susceptible to the natural hazards of hurricanes, floods, earthquakes and droughts. In 1988, hurricane Gilbert demonstrated the potential impact of natural hazards and the need for greater planning, preparation, and rehabilitation capability".14.

In recognition of the level of environmental degradation in the country, the government has begun an elaboration of a National Conservation strategy which is proposed to be implemented shortly and which is it said adequately reflects the concerns of a wide cross section of the population. This move is considered to be the first step in the development of a structured framework for environment and management.

In addition, two major pieces of legislation, The Natural resources Conservation Authority Act and the Natural Resources Conservation Act have been made law. These laws have been created to support both the institutional capability and the enforcement of laws.

The former Act, it is said, provides the Authority with the necessary powers to establish and maintain an effective regime for the protection and conservation of Jamaica's natural resources. The second Act seeks to consolidate and reform certain laws relating to the environment.

Two years have elapsed since the formation of this Agency and the promulgation of these laws but to date one has not seen any dramatic improvement in the existing environmental
degradation and current methods of resource exploitation. History has revealed that the country has never succeeded in surpassing stage four of the evolutionary process as elaborated by Sorensen, et al. Perhaps it is too early to judge the effectiveness of such programme recommendations.

However, it is perceived by the writer that a different approach is necessary for any effective management of the coastal zone. The solution lies in an integrated coastal zone management programme which recognizes the interconnectedness of the resources and the need for cooperation and collaboration between all the various actors involved.

Summary.
Having reviewed the concept and methodology for an integrated coastal zone management in Jamaica, the following chapter will analyze the various strategies pursued by the government over the years to protect and manage the coastal environment. This analysis requires a perusal of the existing policies, Laws and institutions with a view to identify if the management framework is effective and whether it can accommodate the changes which the writer proposes.
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Chapter Five
A Critical Appraisal Of The Strategies Which Have Been Adopted By The Government Of Jamaica Relative To Coastal Zone Management.

This chapter addresses the prospects for coastal zone management in Jamaica. It includes a critical appraisal of national policies and developmental plans, the law and the agencies and institutional arrangements responsible for coastal zone management which have resulted in the absence of an overall coastal zone management policy. Such an analysis will require an evaluation of the strategies adopted by the Jamaican government over the years to protect and manage the coastal zone and its resources; and which the ensuing discussion will address.

5:A. National Policies.
The management framework for coastal resources and development is complex. Currently there is no legally articulated national environmental policy or comprehensive environmental legislation in Jamaica. Sectorial management for economic development has been the norm and it is also typical of the approach adopted by the lesser developed countries. The current governmental priorities are directed towards the promotion of key sectors in the economy which will generate quick foreign exchange to reduce the dept crisis. The Country Environmental Profile of Jamaica outlined governmental priorities focusing on the following: 1.

1) Transformation of agriculture, including crop substitution to emphasize the production of export crops;

2) Promotion of tourism as a major earner of foreign exchange;
3) Support of industrial development, particularly labour-intensive manufacturing;

4) Reducing dependence of the economy on bauxite mining.

While the above are plausible objectives deserving support on the converse there is no islandwide coastal management policy. The existing situation is that coastal resources are divided into a number of sectors under the jurisdiction of several different agencies. These agencies often have different management goals which often result in duplicating and overlapping of functions.

A lead agency is nominated to ensure that the different management sectors carry out their duties. However, the coordinating role of this agency is never clearly institutionalized, therefore, this agency has little managerial clout to supervise the other agencies especially the statutory corporations.

Another point is that the lead agency is answerable to the central government. In this case, the Natural Resources Conservation Authority is answerable to the Ministry of Development Planning and Production. The Agency is given some autonomy where programme development is concerned but only in the implementation strategy. Their plans must conform to policy directives issued by the national government.

This arrangement at most times conflicts with some of the policies of the agency; for instance over the years environmental matters have received low priority by the government and in times of acute economic problems only a token percentage of the national budget is allocated to this agency to carry out its function which renders it almost useless.
The Five Year Development Plan is the major policy document, elaborating the goals and objectives of the different governmental sectors. Such an ad hoc approach makes no recognition of the interconnectedness of the coastal resource systems and the ability of one coastal resource to affect the other. It also does not take into consideration the different user conflicts within the zone and devise ways and means of mitigating existing and future conflicts. This dichotomy is incompatible with integrated resource management which incorporates strategies for minimizing and resolving conflicts within the zone.

Some attempts are currently being made to counteract the shortcomings of management based on sectorial planning by requiring environmental impact assessment to be made on major development projects as stipulated in the NRCA Act. Recent initiatives have also shown a trend towards restructuring the various sectors so that each agency's objectives are consistent. However, the need for comprehensive coastal zone management policy is urgent if the government is seriously committed to environmental protection and management.

The Country Environmental Profile of Jamaica a broad based document which was produced by the National Resources Conservation Department in conjunction with the United States Aid Agency (USAID) comprises draft policy guidelines for a number of sectors such as fisheries, national parks and protected areas, wild life resources, coastal resources, water resources, forestry, agriculture, industry and industrial pollution, energy, human resources, tourism and recreation and mining. Although this document is in place its guidelines are not fully integrated into the policies of the government of the day. The practice is still to adopt piecemeal guidelines as deemed necessary.
Law (Legal Mechanisms)

Laws Relating To Coastal Area Resources, Protection and Management.

The protection and management of the coastal zone resources are addressed by a number of legislations and regulations. These are equally complex. There are at least eighteen statutes existing within the Jamaican legislation and which are monitored by the sixteen governmental agencies outlined in table six.

The following section includes a classification of the various Acts.

National Legislations.

The management of the resources of the coastal areas are facilitated by the following regulations.

1) The Beach Control Authority Act. (1978)

The use or development of beaches and the foreshore within 25m of the shoreline must be approved by the National Resource Conservation Authority. (NRCA). (The Beach Control Authority is now a part of the NRCA) The beach control orders also designate marine parks and restrict activities within the prescribed boundaries.

The provisions include the prohibition of use of public beaches for fishing and control over the construction of shelters on the beach. The construction of jetties and piers must also have the approval of the Port Authority under the Port Authority Act.
2) The Fisheries Act (1975)
Under this Act, fishermen and their vessels must be licensed. In addition, the law provides for the protection of fisheries resources by the establishment of fish sanctuaries and closed seasons and the provisions of penalties for the landing and sale of illegally caught fish. The Morant and Pedro Cay Act establishes special licensing conditions in these cays and prohibits unauthorized fishing and the removal of birds and turtles.

This law as its name indicates governs the conservation of animal life. It prohibits the poisoning and dynamiting of fish, the capture of immature turtles and the taking of the whole or any part of an endangered species. Under this law permits are issued for the collection of booby tern eggs (a special kind of bird which lives in the Lime Cay Area) and the shooting of specified birds.

4) The Public Health Act (1962)
This Act prohibits the discharge in the environment of any substance air borne or water borne which can have a deleterious effect on human life.

The main thrust of this Act is to unite and update the laws relating to natural resources such as the Beach Control Wildlife protection and development of watersheds. In addition the Act incorporates global issues such as transboundary movement of toxic waste, and the regulations of and control of chemicals which contribute to depletion of the ozone layer and contribute to green house effects.
The above strategy has been launched at the request of the Ministry of development, Production and Planning. This strategy embraces the formulation of an action plan designed for the integration of environmental, cultural and socio-economic development planning into the overall development planning of the country. There is also the intention of these policy makers to develop a number of programmes towards this end.

7) The Harbours Act. (1874)
This act prohibits the removal of articles such as sand and gravel from reefs, shoals and cays.

This Act accords the Petroleum Corporation of Jamaica with the right to develop and explore petroleum resources in an environmentally sustainable manner.

This Act addresses the loading, discharge and handling of dangerous goods within the port environment.

This Act stipulates the licensing of all motorised vessels and their operators. In addition, it designates recreational areas along the coastline and outlines the types of activities allowed in the prescribed areas.
5:D Acts Pertaining To the Development and Regulation of the Coastal Area.

This is the principal Act controlling land use and development. Development and control of coastal lands is determined by the Town and Country Planning Act, or the Local Parish Authority, the Urban Development Corporation Act or the Ministry of Housing and Agriculture. These entities are empowered by their respective laws to undertake development in their respective areas.

b) Water Resources.
Water Resources are administered by the Watershed Protection Act (1963), the Underground Water Control Act 1959, the National Water Commission Act (1980) and the Public Health Act (1974). These Acts were compiled from the Jamaica Country Environmental Profile (1987) and modified where necessary.

5:E Legal Problems and Issues.
With such a plethora of environmental legislation it is incredible that Jamaica has such a serious environmental problem. It would be interesting to explore the possible reasons for the ineffectiveness of these legislations. In reviewing the legislative basis for coastal zone management the following major issues have been identified:

1. Inadequate Enforcement of the legislations.
Inadequate promulgation and enforcement of the legislation could be considered a major problem militating against effective coastal zone management. A case in point is the Beach Control Act (1955) which sets out guidelines for development along the beach front and limits for the distance within which development is allowed to occur. One only need to walk along the north coast beaches to see the blatant disregard by developers of the Act.
The inability to enforce the laws is attributable to technical incapacities of agencies in apprehending perpetrators and the lack of funds to employ and retain sufficient conservation staff.

It is important to recognize that to maintain a proper level of enforcement, adequate manpower and funding must be available. For example, the previous NRCD had only two staff with part-time responsibility for enforcement of the Wildlife Protection Act and the Watershed Act. One important point to note is that not all pollution incidents occur between 9am and 5pm and certainly not when an officer is on site. The fishermen in particular fish in the nights.

Which one of these officers is on site to see when they are dynamiting the fish or which law officer is there to apprehend them?. Clearly, this lack of funding and manpower ensures that the enforcement agency is left powerless and as was the case of the previous NRCD.

One needs to recognize that it is difficult for people to effectively carry out their function when they themselves are uncommitted to the job either because they are not properly paid or they are frustrated because they do not have the tools to do their jobs.

This needs to be taken into consideration before passing laws and requiring compliance. People need to have job satisfaction and also to be adequately remunerated. With this degree of motivation it is quite natural that they will be more diligent in carrying out their duties.
Another contributory factor is that the fines for breaches of the various conservation laws are minimal, consequently, they are not an effective deterrent to perpetrators. For example, breaches of the Wildlife Act are subject a maximum fine of only one hundred Jamaican dollars (100) or five United States Dollars (USD 5.00). Also the Port Authority Act which prohibits the discharge of "rubbish, earth stones, ballast, oil, mud or mixtures with oil or its residue in any harbour or ship" is certainly not enforced. The visual observation of effluent which are discharged into Kingston Harbour and adjoining gullies is enough evidence to support this statement. It is therefore important to establish deterrent penalties of sufficient magnitude for non compliance and the implementation of adequate enforcement mechanisms by the regulatory agencies.

In addition to the problem of enforcing the laws, the laws are also outdated. A cursory glance shows some of them dating back to the 1950's.

2. Lack of Public Awareness of the Need for Conservation. Another major problem which hinders the advance of coastal resource management seem to lie in the above. There has been a wide spread lack of sensitivity as it relates to the nature of the environment in Jamaica.

A significant proportion of the population is still unaware that the natural resources are not infinitely inexhaustible. This is what some scholars call the" tragedy of the commons". Some fishermen argue that the sea is boundless and therefore, the supplies of fish are limitless. "It can't done", they say.
Another sect in the society, the Rastafarians share the same philosophy. It is therefore, difficult to successfully implement conservation programmes as a result of these different misconceptions.

The above situation overtly expresses the need for a massive public education programme to sensitize the population regarding the long term benefits to be derived from an integrated coastal zone management programme.

3. Lack of Unified Planning and Administrative Fragmentation.

One of the inherent problems of coastal zone management is the large number of sectorial divisions and the corresponding number of government bureaucracies with decision making powers that directly or indirectly affect coastal resources, use and users. It is apparent that the greater the number of sectorial divisions the greater the potential for fragmentation of governmental responsibilities and duplication of effort.

It is a customary practice in Jamaica for each agency to do things its own way. There is a lack of unified consideration and indispensable proof of how to distribute and exploit the resources of the zone so as to obtain the greatest benefits.

In addition, the utilization of the zone is distributed on the basis that whoever owns it can exploit it. As a result neighbouring agencies can interfere with each other directly and indirectly as they pursue their independent course of action. For instance, some stretches of coastline which are suitable for agriculture have been utilized for urbanization and tourist development, thereby pushing the farmers into the interior.
Clearly the problems of administrative fragmentation and overlapping inevitably leads to the following:

a) Weakness in integration, coordination and administration.

b) No connections between research and exploitation of the coastal zone.

c) Different administrative agencies compete for power. For instance, all these agencies want to extend the limits of their authority.

e) Each specialized agency is not qualified for integrated management of the coastal zone. Therefore, the administration of the Territorial sea, the Continental Shelf and the Exclusive Economic Zone has been affected by a stultifying time lag. Furthermore, the planning of marine areas are designed to focus on single marine functions which are often thought of as an extension of land based activities. Fisheries is placed under the Ministry of Agriculture.

Also the Inter-agency Committee of the Ministry of Development and Planning does not have the Fisheries Division under its portfolio. This focuses on sectorial planning and management.

Clearly, this perspective does not take account of interaction between sectors. National authorities have concentrated their efforts on land planning while the planning of the open sea is often neglected. This dichotomy is reflected in their practical applications since projects and programmes are designed and implemented independently.
5:F. The National Contingency Plan.

There is always the potential risk of Jamaica's coastline, fisheries, human health and welfare and the marine environment being threatened due to the high tanker traffic passing near Jamaica on a daily basis. In recognition of the vulnerability of the island to spills, the Jamaican government in 1980 spearheaded the drafting of a national contingency plan for the island.

An analysis of the Plan showed that it contains to a great extent all the specified elements that are associated with a contingency. It is also noted that it incorporates provisions for regional cooperation in the event of a contingency.

The following major drawbacks were however, observed.

a) The Plan does not clearly define the specific task for the Jamaica Defence Force and the Natural Resources Conservation Agency.

While it is noted that investigative responsibilities for spills or other hazardous substances are assigned to these agencies the specific task to be performed in the event of a mishap is not clearly elaborated. It is imperative that this be immediately addressed for in the event of an accident there will be chaos and confusion between these agencies and this could very well retard the response time which is very crucial to the effective combatting of spills.
b) An examination of the Plan reveals that it does not have any provisions for up-dating and exercising it. It does not mention any simulation and paper exercises allowing the relative effectiveness of the plan to be scrutinized under conditions which approximate an actual incident. It is being suggested that such a plan needs to be rehearsed to test its emergency responsiveness to combating accidents.

Furthermore, the Plan does not name an individual as being responsible for updating it and distributing revision to plan holders. Such a Plan needs to state specifically the date and time of the revocation.

c) While the Plan is also applicable to spills on land that may migrate to or flow into Jamaican waters, there is no supporting legislation. This aspect of the plan needs to be formalized.

Another strategy which is used by the Jamaican government in the management of the coastal zone is surveillance and monitoring to assess how people are using certain designated management areas and the level of compliance.

The Jamaica Defence Force Coast Guard is mainly responsible for policing the coastal zone; however, the lack of funds, obsolete weapons and the lack of adequate high speed boats to assist them in swiftly apprehending law breakers have seriously retarded the effective policing and monitoring of the coast.
The surveillance techniques used can be considered to be passive, such as log books in the case of the artisanal fishermen, permits or license and reporting by volunteers. However, the inadequate patrol boats and inspectors in the coastal zone renders surveillance ineffective.

The presence of Honduran and Columbian fishing vessels in Jamaican waters is a cause for concern. Fishermen in Whitehouse, Westmoreland have frequently reported several number of fishing vessels fishing off the Pedro Cays. The Jamaican fishermen have expressed fear for their lives owing to the fact that the illegal fishing boats were larger than their’s and that the men were some times armed. This situation clearly indicates that the coast is not properly monitored.

During the two months period when the Fisheries Division of the Ministry of Agriculture placed a ban on the catching of lobsters, the fishermen in Westmoreland observed foreign fishermen fishing for lobsters off the Bank.

This does not suggests that there have not been reports of people who have been apprehended and fined in the court but the continued presence of foreigners in the territorial waters attest to the fact that the coast is not properly monitored.

Surveillance and monitoring of the protected parks and fish sanctuaries is virtually non existent. Accordingly, the marine protected parks are used as fishing grounds because there are no wardens. Undersized lobsters are taken because there are no inspectors on the fishing beaches. This situation is in part due to the acute problems of unemployment in the country.
Some fishermen recognize the need for fish conservation but they say, "We have to eat". In this situation how can one apprehend a poor fisherman who is struggling to survive. The immediate needs of the people also have to be taken into consideration.

5: Existing Protection Orders: Marine Protected Parks and Fish Sanctuary.

The most common strategy for coastal zones and resources is the establishment of marine parks and critical area protection (that is the establishment of coastal reserves). The Beach Control Protected Area, Montego Bay Order and The Beach Control Protected Area, Ocho Rios Order have declared Montego Bay and Ocho Rios Marine Parks as protected areas. The primary objective is to protect the shallow reef environment.

Neither area has benefited much from its legal protection. Money and personnel have not been available for enforcement, nor for the creation of the superstructure of a functioning marine park.

The Bogue lagoon was declared a fish sanctuary in August 1979 to last indefinitely. However, fishing still goes on there, just as in the marine park.
Table 6.

List Of Institutions Concerned With Coastal Zone Activities In Jamaica.

a) Resource Management Institutions.  
1. Natural Resources Conservation Agency. (NRCA)  
2. The Town and Country Planning Department. (TPD)  
3. The Town and Country Planning Authority. (TPDA)  
4. Environmental Control Division. (ECD)  
5. Urban Development Corporation. (UDC)

B) Economic Planning And Investment Agencies.  
1. Planning Institute of Jamaica. (PIOJ)  
2. Urban Development Corporation. (UDC)  
3. Petroleum Corporation of Jamaica (PCJ)  
4. Jamaica National Investment Promotions Limited (JNIP)  
5. Jamaica Industrial Development Corporation (JIDC)  

C) Agencies Responsible for Coastal Development and Protection.  
1. The Fisheries Division (ministry of Agriculture)  
2. Ministry of Mining. (MN)  
3. The Petroleum Corporation of Jamaica (PCJ)  
4. Ministry of Local Government (MLG)  
5. Ministry of Public Utilities, Transport and Energy (MPUTE)  
6. Port Authority of Jamaica. (PAJ)  
7. Underground Water Authority (UWA)  
8. Ministry of Development, Planning and Production
D) Non-Governmental Organizations and Institutions.

1. Institute of Jamaica (IOJ).
2. Jamaica Junior Naturalist. (JJN)
3. Scientific Research Council (SRC)
4. University of the West Indies. (Marine Scientific Unit)
5. Jamaica Society of Scientists and Technologists.
8. The Jamaica Conservation and Development Trust. (JCDT)

E) Other Agencies With Environmentally Related Activities.

1. The Survey Department (Ministry of Agriculture)
2. The Beach Control Authority (BCA)
3. Jamaica National Heritage Trust. (JNHT)
4. National Council on Libraries, Archives and Documentation Centre (NACOLADS)
5. The Jamaica Tourist Board (JTB)
6. Office of Disaster Preparedness (ODP)
7. Ministry of Construction (MOC)
8. Ministry of Tourism and Environment. (MTE)

The list of institutions were compiled from the Jamaica Country Environmental Profile and from Peter Bacons list as modified from Chow. 6.


Over the past two decades Jamaica has been struggling to establish an appropriate and adequate institutional mechanism to effectively manage the coastal zone resources but to date without much success. As was previously stated, environmental matters have always received a low priority.
As a result of this tendency Jamaica has never succeeded in surpassing stage four of the evolutionary process as posited by Sorensen. 6. From all indications, something is radically wrong.

It is apparent that the answer is not to be found in multiplying institutions but what is important is the provision of the tools for these institutions to work with. The old maxim says "You cannot make bread out of stone" clearly exemplifies the situation in the country. The Jamaica country environmental profile attributes this institutional failure to "lack of trained and qualified personnel and lack of adequate funds to support the proposed programmes". 7.

Table six presents a list of governmental organizations related to functional or sectoral aspects of coastal zone and marine management. As can be observed there are fifteen governmental organizations that have some form of administrative authority within the coastal zone. Their overlapping and multi-functional activities are presented in the form of a matrix in table seven giving clear indication of the complexity of arrangements. Most of these agencies have functions which are part of or which concern coastal zone activities. The obvious question is what mechanism exists to coordinate activities? It is known that there is no continuous cooperation between the authorities involved.

Consultation may take place on an ad-hoc basis but there is no institutionalized mechanisms to promote this process such as consultative committees. Cooperation may take place through informal channels but this is not good enough. Any effective coastal zone management approach must rely on continuous coordination between as well as with different levels of government. 8.
### TABLE 7 - MATRIX OF SECTORAL ACTIVITY

<table>
<thead>
<tr>
<th>FUNCTIONS</th>
<th>Port Development</th>
<th>Fisheries</th>
<th>Pollution Control or Monitoring</th>
<th>Parks &amp; Recreation</th>
<th>Tourism Development</th>
<th>Marine Research</th>
<th>Energy Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recomds., adv. and some policy-making</td>
<td>TPD, PIOJ, UDC, PAJ, DPP</td>
<td>PIOJ, FISH-DIV.</td>
<td>ECD, NRCD, UDC, PAJ, ODP</td>
<td>TPD, PIOJ, UDC, MPM</td>
<td>TPD, UDC, PAJ, ODP</td>
<td>NRCD, UDC, FISH-DIV</td>
<td>NRCD, PCJ</td>
</tr>
<tr>
<td>Regulations, fines, permit setting</td>
<td>TPD, UDC, PAJ</td>
<td>FISH-DIV.</td>
<td>ECD, NRCD, UDC</td>
<td>TPD, UDC, MPM</td>
<td>TPD, UDC, PAJ, JTB</td>
<td>-</td>
<td>NRCD, PCJ</td>
</tr>
<tr>
<td>Economic planning and investment control</td>
<td>PIOJ, UDC, DPP</td>
<td>FISH-DIV.</td>
<td></td>
<td>UDC, MPM</td>
<td>PIOJ, UDC, PAJ, JTB, DPP</td>
<td>-</td>
<td>PCJ</td>
</tr>
<tr>
<td>Fund and construct projects/programs</td>
<td>TPD, UDC, PAJ</td>
<td>FISH-DIV.</td>
<td></td>
<td>TPD, UDC, MPM</td>
<td>UDC, PAJ, JTB</td>
<td>FISH-DIV., UWI</td>
<td>PCJ</td>
</tr>
<tr>
<td>Acquire, manage/sell property</td>
<td>TPD, UDC, PAJ</td>
<td>-</td>
<td></td>
<td>TPD, UDC, MPM</td>
<td>UDC, JTB</td>
<td>-</td>
<td>PCJ</td>
</tr>
<tr>
<td>Generate and disseminate information</td>
<td>NRCD, TPD, PAJ</td>
<td>NRCD, FISH-DIV., UWI</td>
<td>NRCD, UDC, ODP</td>
<td>TPD, NRCD</td>
<td>UDC, PAJ, JTB</td>
<td>FISH-DIV., UWI SD, SRC</td>
<td>NRCD, PCJ</td>
</tr>
<tr>
<td>Environmental Impact Assessment</td>
<td>NRCD, UDC</td>
<td>NRCD, UWI</td>
<td>NRCD, ECD, UDC</td>
<td>NRCD, UDC</td>
<td>UDC</td>
<td>-</td>
<td>NRCD, PCJ</td>
</tr>
</tbody>
</table>

**TABLE 7**
It is also known that some of the agencies are not very open and sometimes projects are carried out in great secrecy. This is not good management. This often results in duplication and unnecessary waste of scarce resources which are so greatly lacking in the country. It is therefore, important to increase coordination in order to promote consistency and effectiveness within policies and to reduce fragmented responsibility, waste and conflicts.

A national coastal zone policy is required to regulate and direct the management process.

The matrix at table seven also shows that six of these organizations are statutory bodies, while the others except for the University of the West Indies are departments under other ministries. As can be observed from the matrix there are no less than two organizations responsible for governance. A case in point is the tourist sector.

Additionally there are five organizations with functions related to the development of the coastal zone such as policy making, regulation, planning and construction. Of these only one, the UDC does any form of environmental impact assessment of its development projects.

The UDC is responsible for the planning and development of land owned by the corporation. This Organization has tremendous power owing to the fact that it does not answer to any organization for the impact of its development projects. Although required to submit its development plans to the relevant parish council for comment this does not lessen their power.
Another Agency, the Town and Country Planning Department regulates the physical planning and development of the country. This department has virtually no control over such agencies as the UDC and the Jamaica Tourist board which is responsible for the development of existing and proposed tourist development sites. As is apparent, a great deal of duplication of effort and overlapping occurs between these organizations and the Planning Institute of Jamaica.

In the pollution monitoring and control sector, the ECD; NRCA; UDC; PAJ and ODP are agencies within different ministries and with varying mandates, however, all monitor marine pollution. The ECD monitors water quality for the formation of public health standards while the UDC monitors any pollution generated from its investment projects.

The Port Authority of Jamaica monitors oil spills in the country's ports in conjunction with the NRCD and the ODP. Objectively speaking, there exists a bit of horizontal integration between these institutions but the absence of a strong coordinating body militates against the smooth functioning and operation of these bodies.

The NRCA is the country's main resource management and conservation agency. It is primarily responsible for environmental policy for monitoring and controlling of the utilization and development of the nation's natural resources, including those of the coastal zone. Over the past decade this Agency has changed hands four times. In the past it was a sub-division in the Science and technology department within the Ministry of Agriculture. Based on available information it was observed that at one time it was under the Ministry of Mining and Natural Resources; and still another time it was answerable to the
Ministry of Finance and Planning. Today, it is under the Ministry of Development, Planning and Production. So within a decade this agency has changed hands four times under different political regimes and within that period too it was demoted on two occasions to divisional status.

The recent NRCA ACT of 1991 gives it statutory status and makes it answerable to the Ministry of Development, Planning and Production. Psychologically, this is not good for the Agency. It cannot be perceived that name changing is an indication of management. Furthermore, the high turnover of staff coupled with low morale were factors which continually plagued this organization.

During the 1980's a low priority was accorded to environmental matters which further starved the agency of funds to such an extent that it was only another building existing along Molynes road and not a management Agency. It had no clout to control the activities of the organizations under its purview and subsequently it was perceived as a "toothless bulldog".

The recent re-creation of the NRCA is no indication that the situation will be much improved. History has shown that Jamaica is a country which assumes that having established an institution then all the problems are automatically solved. Furthermore, it is also assumed that having said something, it is done, or once laws are on paper it means that they are implemented. The necessary follow up is usually lacking.
The country's politicians are famous for making grandiose statements however in most cases they forget to do the paper work and find the human resources and other resources necessary to implement what is supposed to be done. The Agency having been established must be given the tools to do a good job. One wonders whether the authorities are serious about the country's development.

The writer is in no way indicating that the creation of the NRCA is not a positive move but if past performance is any indication of the way this agency will function it would be relatively accurate to assume that the road to effective and sound environmental management will be a tedious and difficult path. For instance, Part 3:1.A of the Act states that the payment of salaries over 50,000 Jamaican dollars per annum should receive the prior approval of the Minister. (The Jamaican dollar currently exchanges at 20:1 United States dollar). This is absurd when one considers the financial crisis in the island. One also has to take into account the high salaries which are paid by the private sector organizations compared with the salary scales of this Agency. In this regard, fifty thousand dollars is just a drop in the bucket. If the agency intends to recruit trained and qualified staff this is a problem which has to be addressed. Any graduate will think twice before accepting a job with this agency when the private sector salaries are significantly more attractive. Is this an indication of the caliber of personnel that the agency wishes to recruit?

It cannot be overemphasized that coastal zone administration requires management that is intelligent, objective, imaginative, daring, forthright and determined.
A sound approach to policy formation is required; one which is oriented towards the development of governmental institutions and the management system. In this regard, there is the need for such a body to be staffed with the nation's scientists, professionals and university staff if the government is serious about environmental management.

A perusal of the Act clearly demonstrates that the level of funding required to surmount the magnitude of the problems is far in excess of what is currently projected. Also, the stated objectives are broad and these need to be more clearly defined and similarly to be quantified. In the absence of a clear national policy for the coastal zone it is logical to assume that the management process will continue along its ad-hoc approach.

Another serious issue to consider is the impact of the two party system on the continuity of the projects over time. These politicians and senior managers are in power for five years at most thus visible results must be achieved before election; therefore, the programmes and policies of the various agencies are often dominated by short term planning.

Another factor too, is that the priority of the Peoples National Party may be different from the Jamaica Labour Party. Therefore, with a change of government the practice is to discontinue the previous plans in progress or the developmental policies which were articulated by the former government with the aim of instituting the policies of the new regime. Therefore, many environmental policies and projects are shelved based on this narrow perception. It is therefore of paramount importance for development to transcend political boundaries. If the policy is sound why shouldn't it be continued over time?
There is the need for a strategic plan, encompassing planning on a longer term basis such as ten or fifteen years instead of short sighted policies of five years to culminate with the end of the political term of the government. This is a serious obstacle which must be surmounted. This lack of sustained action by the government to match its political will has retarded the overall policy for coastal conservation and development.

Another concern is that each of these organizations has the prerogative of setting its own priority. Consequently, the link between comprehensive planning, development and management is rather tenuous.

Another matter which is of concern is the recent addition of environmental function to the Ministry of Tourism. This action cannot in any way be considered to be a wise move. It is ironical that simultaneously the Natural Resources Conservation Authority was re-established and given statutory status. The government has also assigned environmental matters to the Ministry of Tourism. This duplication of functions need to be addressed. It is imperative that recognition be given to the interconnectedness of the resources.

A perusal of the functions of this NRCA indicates that the environmental aspect should very well be under its purview. Although the mandate is considered to be impressive in the writer's view it is very narrow in scope. The main emphasis is on land based planning while ignoring the marine component. It is important to recognize the mandate of introducing the marine dimension into the national economic planning and development programme.
Secondly, this organization needs to be more decentralized. Although coastal zone management units have been delineated according to parish boundaries there is an over centralization of the institutions and agencies dealing with coastal and marine matters. Most of these agencies are located in Kingston, the capital city and therefore, where specific problems occur decision making bodies are far removed.

In addition, the over centralization makes enforcement of legislation all over the island very difficult. Only well organized and de-centralized agencies with adequate man power and finance will be able to effectively implement and enforce the legislative instruments.

There is the need for the establishment of regional bodies in the three counties even if it is merely for the fact of maintaining a presence. In recognition also of the multiplicity of interests in the coastal zone there is the need for a consultative mechanism to provide a voice for coastal zone interest. This committee should incorporate private sector groups, ministerial representatives and the local population.

There is the need to move away from ad-hoc strategies to more permanent arrangements which take a wholistic perspective of the coastal zone. There is no denying the fact that the present arrangement is entirely unsatisfactory and incapable of managing the coastal zone unless it is structurally and functionally reorganized. This involves increasing the levels of vertical and horizontal integration. The nature of this challenge is represented by the following words of the World Commission on Environment and Development (WCED):
Figure 20
A proposed Coastal Zone Management And Development Agency for Jamaica
"The integrated and interdependent nature of the new challenges and issues contrast sharply with the nature of the institutions that exist today. These institutions tend to be independent, fragmented and working to relatively narrow mandates with closed decision processes. Those responsibilities for managing natural resources and protecting the environment are institutionally separated from those responsibilities for managing the economy. The real world of interlocked economic and ecological systems will not change; the policies and institutions must.".

5.1. A Proposed Organizational Structure For Integrated Coastal Zone Management In Jamaica.

In recognition of the challenges involved in the process of integrated coastal zone management it is perceived that the existing administrative structure is inadequate for the task. In light of the above, the writer is constrained to propose the establishment of a Coastal Zone Management and Development Agency with comprehensive jurisdiction for the protection, conservation and development of the Jamaican coastal zone and its resources. The current NRCA has lost its credibility and therefore should be dismantled and its responsibilities transferred to this new Agency.

Figure 20 presents an outline of the general organization of this Agency. The Agency could be named, "Coastal Zone Management and Development Agency." It should be directed by a Director General and staffed by the distinguished Jamaican scientists and the nations professionals. Some of the existing staff of the NRCA could be seconded to work with this new Agency.
The proposed Agency would require updated and new legislation to give it a clear mandate while establishing its authority as the sole Agency responsible for directing coastal zone management and planning. The first step would be for the government to elaborate a comprehensive national coastal zone management policy which would provide clear objectives which should be pursued. This policy should incorporate and solicit the views of users and the public who will be affected.

5:J.1 Functions of the Agency.

a) One of the first tasks of this Agency should be to elaborate the formulation of a national coastal zone management policy act and to put in place the programmes necessary for its implementation. This policy should be broad based and should solicit the views of the public prior to its adoption.

b) To ensure the national participation in the work of regional and international organizations related to coastal zone management matters and to promote bilateral and multi-lateral relations in order to help the government to assume the most suitable policy for the nation.

c) To provide a system of continuous training and professional improvement of staff.

d) To strengthen the scientific, technical, managerial and administrative capabilities of the Country.

e) To integrate, coordinate, regulate and monitor the activities of various uses of the coast.

f) To review and coordinate all coastal and marine development plans as well as the development activities that impact on the resources and the coastal and marine environment. This would include activities such as biological and natural resource development, port development, urban development, tourism development, fisheries development, industrial development that has an impact on the environment.
g) To prepare guidelines for Environmental Impact Assessment Statements as a means of introducing integrated management at the start of a project thereby minimizing devastating impacts of a development activity on another resource.

h) To coordinate and monitor development of the marine and coastal resources.

i) To establish and set environmental quality guidelines with regard to water quality, and monitor pollution levels.

j) To develop and maintain a data base on coastal resources utilizing coastal atlases and geographic information systems as a means of facilitating the identification of management issues and to facilitate the creation of an integrated resource management programme.

k) To institutionalize land use planning incorporating zoning of areas for certain use as a strategy for resolving conflicts.

l) To identify critical areas for protection for example, the coral reefs on the narrow continental shelf on the north coast of the island.

5.2. Other Proposals.

It is also proposed that the environmental responsibility be removed from the Ministry of Tourism and be placed under this Agency. Also, the Fisheries Section of the Ministry of Agriculture should be placed under this Agency. While it is recognized that fishing is affiliated to this Ministry because many states consider fish the product of the fishing industry it is evident that there are stronger ties with the Ministry of Transport which deals with all matters related to marine navigation and to the safety of fishing vessels. The serious problem of overfishing and the multiplicity of problems faced by this organization attest to the fact that they are incapable of carrying out their responsibility.
The responsibilities allocated to coastal state under the United Nations Law of the Sea to Protect and preserve the marine environment clearly requires effective management of the EEZ; This department is also currently under staffed therefore, this move could help in pooling some of the needed resources in this direction.

5.3 Status of the Agency.
In terms of status, this Agency should be given statutory status. Also, the Government should as a matter of urgency elaborate an island wide coastal zone policy. It is also necessary to legally delineate the coastal zone which is to be managed in order to clearly identify the area which is to be managed.

This Agency should continue to report to the Ministry of Development Planning and Production. Recognizing that one action in one area of the coast will undoubtedly have an effect in another it is recommended that all the environmentally related agencies mentioned in table eight should be formalized into a consultative committee incorporating members from the private sector organizations with vested interest in the coastal zone and representatives from the various regional bodies which are based in the Country, for example, the United Nations Environment Programme (UNEP).
5:1. The Organizational Structure of the Coastal Zone Management and Development Agency.

1) Inter-Ministerial Committee.

Sorensen, et al. posit that such a Committee offers a good short term solution for the following reasons: 10.

a) It provides a way of rapidly concentrating attention on pressing issues, and;

2) It avoids the creation of a permanent agency ill-designed to cope with its assigned task.

This Committee should be chaired by the Prime Minister of Jamaica. It will be responsible for formulating the national coastal zone policy and setting goals and objectives for the planning and management of the coastal zone.

The representatives on this Committee should consist of the following representatives of the various government agencies concerned with resource planning, economy and transport and additionally qualified personnel to give advice:
a) Town Planning Department.

b) Ministry of Tourism.

c) The Jamaica Tourist Board.

d) The Environmental Control Division of the Ministry of Health.

e) Urban development Corporation.

f) Ministry of Public Utilities and Transport.

g) Port Authority of Jamaica.

h) Ministry of Finance.

i) Petroleum Corporation of Jamaica (PCJ).

j) Ministry of Defence

k) Planning Institute of Jamaica.

l) Jamaica National Investment Promotions (JNIP).

m) The Attorney General's Office.

2) Consultative Committee.

Coastal management involves a range of activities, each with legal, scientific and political component bearing this in mind the Director General should dispose of a Consultative Committee from which he will obtain scientific and technical advice to assist in policy formulation and implementation.
This Committee should be chaired by the Director General and should include representatives of the following entities:

a) The University of the West Indies, Marine Science Unit, geological, Botanical Unit.

b) Private Sector Organizations.

c) Non Governmental Organizations which are currently active in environmental matters such as:

1. The Hope Zoo Thrust.

2. The natural History Society.

3. The Jamaica Junior Naturalists.

4. The Jamaica Conservation and Development Trust (JCDT)

5. The National Environmental Societies Trust (NEST).

3. The Office of Coastal Zone Management and Development.

This would be a new organization with responsibility for the planning and management of the coastal zone. It would also be responsible for implementing the programmes and actions necessary as regards the formulation of national policies. The following would also be included in the list of duties.


c. Land Use Planning.

d. Permit Issuing.

e. Examination of proposed development project application.
4. Regional Office.
This Office would be responsible for the operations of the various divisions in the uplands with a view to the conservation of watersheds and to maintain standards of ground water resources. The office will also consist of the Atmospheric Division which will be responsible for the monitoring and maintenance of amenable atmospheric conditions.

This office would in addition, be responsible for special area regional plans such as bays, marine parks and fish sanctuaries.

The Offices would be responsible for the recommendation of policies and objectives to the Director General who would then report to the Inter-Ministerial Committee.

In addition, this Office would be responsible for ensuring the effective implementation and monitoring of projects and programmes.

5. Office for Regional and International Affairs.

The approach to coastal zone management will be integrated. This will be streamlined through national and regional development policies. The setting up of national and regional committees will allow for interrelation, interdependence and interconnection of the various uses of the coastal and marine environments all being focused on marine resources and sustainable development for present and future generations. In this regard, this office would harmonize and coordinate the activities of regional and international organizations concerning coastal and marine affairs.
2. Also, the office will be responsible for the arrangement of technical assistance in the form of funding for projects, or experts, consultants and training programmes and seminars.

3. To utilize funding and other available resources from these organizations to facilitate programmes aimed at the preservation and development of the environment.

4. To ensure participation in IMO meetings and preparing the necessary instruments for ratification of relevant conventions.

4. To ensure the national participation in the work of international organizations related to coastal zone management affairs such as IMO; UNEP; UNESCO, ECLAC, and UNCTAD.


This Office would carry out the following responsibilities:

a) Oversee the National Contingency Plan.

b) Updating, testing and exercising the Plan.

c) Prepare for mitigation of disasters.
7. Environmental Protection unit.
The responsibilities of this Unit are outlined below:

1) To conduct marine and coastal inventories and environmental assessment on the types and effects of pollution.

2) To oversee the monitoring and research capabilities of its division.

3) It will also be responsible for setting environmental and public health standards.

4) To promote research experimentation and innovation in conservation and to develop a modern data base including a scientific and technical centre.

Summary.

It is recognized that institution building is a slow and expensive process but this does not negate the fact that a good organizational structure is a necessary criterion for success. If the staff are motivated and equally equipped with the necessary expertise to understand the organization's role, they will perform their task effectively. To achieve this objective, the manpower resources must be properly and continuously trained to improve knowledge, skills and attitudes.
International organizations play an important role in the development of coastal zone management programmes in Jamaica and the Caribbean region in general. The main administrative organizations in this regard are the following:

1) The International Maritime Organization (IMO).

2) The United Nations (UN).


5:MI. International Maritime Organization.

The International Maritime Organization in its quest for "safer ships and cleaner oceans" has dedicated its effort to the development of maritime standards in the formulation of maritime safety legislations and marine environment protection legislations. There are four committees through which IMO gets most of its work done. These are:

a) The Marine Safety Committee.

b) The Legal Committee.

c) The Technical Corporation Committee and:

d) The Marine Environmental Protection Committee (MEPC)
The two Committees of interest to the topic are the MEPC and the Technical Corporation Committee.

5.1. The Marine Environmental Protection Committee.

This Committee deals with the environmental aspects of shipping and all facets of Convention on the Prevention of Marine Pollution from Ships (MARPOL). It also coordinates pollution control activities between IMO and other agencies.

5.1.2. The Technical Cooperation Committee.

This Committee was created in response to the growing need of the developing countries for technical assistance for their shipping industries. The main thrust of projects funded under the sponsorship of this Committee is the improvement of safety standards, pollution prevention and increased awareness in the maritime administration. The creation of the World Maritime University was a response in meeting this obligation in assisting developing countries through the provision of training for their nationals. It cannot be overemphasized that this organization is certainly doing a tremendous job in this regard. Since its inception in 1983, it has turned out over seven hundred graduates who have returned to their countries to foster and promote the motto of IMO through safer ships and cleaner oceans.
Jamaica and IMO.

The IMO has developed several legislations with regard to the marine environment. Table eleven presents a comprehensive list of all the relevant IMO instruments concerning the marine environment.

Jamaica supports and participates in IMO related activities and for this purpose has ratified the following international instruments.


b) International Convention for Preventing Collisions at Sea (COLREG) 1972.

c) International Convention on Load Lines. 1986


As was indicated in chapters one and three UNCLOS 3 is the single most important treaty in the administration of the marine environment. Section twelve (XII) of this Convention deals specifically with the protection of and preservation of the marine environment. Article 192 states that "States have the obligation to protect and preserve the marine environment". It therefore, makes this obligation mandatory for participating states to effect the necessary pollution control measures.

5:N.1 Jamaica and UNCLOS 3.

Although Jamaica has ratified the above convention from all appearances it has failed miserably to live up to its obligations. The articles of these conventions have not been incorporated into the national laws. Furthermore, as was pointed out the legislative base is unable to effectively enforce the laws owing to the magnitude of problems which were outlined.

In recognition of the fact that certain environmental problems such as pollution prevention are global issues Jamaica needs to cooperate with other counties in addressing this problem for which UNCLOS 3 has made the provision.
5.0. The United Nations Environment Programme (UNEP) Regional Conventions.

The United Nations Environment Programme was created for the purpose of coordinating the actions of the existing United Nations Agencies. The Regional Seas Programme of UNEP was initiated in 1974. This programme is an action oriented programme comprising a comprehensive transsectoral approach to marine and coastal areas and to environmental problems as regards the consequences of environmental degradation. Each programme is specifically designed for the specific region to which it refers. The governments of the relevant regions are involved in the programme beginning with the formation of the action plan.

The Action Plan of the Caribbean region was adopted in 1981 and the coordinating centre is sited in Kingston, Jamaica. In terms of support to the Secretariat, Jamaica provides support for one professional and one general service staff member as well as the provision of office space and the maintenance of equipment.


The principal objective of this plan is to assist governments in minimizing environmental problems through assessment of the state of the environment and development activities. UNEP currently monitors pollution levels on a small scale in the regional sea.
In addition, two regional agreements for the protection and development of the marine environments of the wider Caribbean regions have been adopted under the auspices of UNEP in 1983. These are: The Convention for the Protection and Development of the Wider Caribbean, known as the Cartagena Convention and; The Protocol concerning combatting of oil spills in the region.

Current programmes which are being carried out in Jamaica include the following:

a) A Management Plan for the West Indian Manatee in Jamaica. The major objective of this activity is to determine the status of the West Indian manatee in Jamaica as well as the effectiveness of conservation methods which have been put in place in order to develop a management plan which can be used as a model for the wider Caribbean region.

b) Regional Programme for the Assessment and Control of Marine Pollution in the Wider Caribbean (CEPOL).

This programme is comprised of the following activities:
1. Control of Domestic, Industrial and Agricultural Land Based Sources of Pollution.

2. Baseline Studies on Pesticides Contamination and Formulation of Control Measures.

3. Monitoring of the Sanitary Qualities of Bathing and Shell Fish Growing Waters.

4. Monitoring and Control of Pollution by Oil and Marine Debris.

c) A Sub-Regional Oil Spill Contingency Planning in the Wider Caribbean (Phase II).
Summary.

The important role that these organizations play in assisting developing countries in their quest for sustainable development cannot be overemphasized. By way of assistance, they provide funding for research, surveys and the convening of conferences to promote dialogue between states. In addition, they draw attention to the need for coastal management by highlighting and opposing detrimental governmental actions.

It is clear that the Caribbean Environment Programme is a viable means for regional cooperation for all governments and one which can greatly assist in the formulation of a regional strategy for the sustainable development of the marine and coastal resources of the Wider Caribbean. This Action Plan is to be perceived as a viable instrument to be utilized as a means of achieving some success in addressing the numerous environmental problems of Jamaica. Jamaica has an even greater advantage for the mere fact that the Secretariat is sited there.

In addition, the IMO offers an international forum for open discussion of international problems and offers the willingness to assist developing countries through the provision of technical assistance, consultancy service and by providing a volume of meaningful data to organizations.

While world attention is focused on coastal zone management and while the international community is willing to lend assistance; Jamaica should take advantage of this opportunity by establishing an effective coastal zone management framework to ensure the sustainable development of its resources for the present and future generations.
General Summary.

This chapter has discussed at great length the strategies which have been adopted by the government of Jamaica relative to the management of the coastal zone and its resources. It has also magnified the inherent institutional and legislative weaknesses which have retarded the successful realization of integrated coastal zone management.

The writer proceeded to put forward a number of remedial actions, the foremost of which is the establishment of a Coastal Zone Management and Development Agency to be solely responsible for the protection and management of the Jamaican coastal zone.
References and Notes for chapter five.

1. Jamaica Country Environmental Profile
2. Ibid
3. Ibid
4. Jamaica National Contingency Plan
5. Ibid
6. Ibid
7. Ibid
8. Ibid
10. Sorensen, et al
Chapter Six.
A Guided Manual For Integrated Coastal Zone Management In Jamaica.

Having examined the critical issues in the coastal zone related activities in Jamaica and evaluated the strategies implemented to manage these resources it can be concluded that there is an urgent need for a policy framework for the governance and policy makers of Jamaica to be guided by in the struggle towards integrated resource management.

There are several steps to be taken in the attainment of this goal. Recommended for consideration are the main ingredients that should be included in the formulation of such a policy. This section relies heavily on the work of Cesna Mc Kain for the methodology used. However, it presents some general guidance that is relevant to the management of the coastal zone. In the process of devising the policy the following criteria must apply.

6:1) Need For A Policy.
A fundamental requirement for a coastal management programme is a national policy for the coastal environment and the exploitation of its resources. As was expressed in the previous chapter Jamaica has not developed an overall coastal management policy for the nation. In this regard, one of the first tasks of the Interministerial Committee would be to address the development of a comprehensive national environmental policy with the dual purpose of increasing public awareness of the benefits to be gained from sound environmental management. Secondly it should provide a framework for realizing sustainable development.
6:1.A) **Definition of Policy.**
A policy is defined as a set of guiding principles or procedures designed to influence the actions and decisions of individuals or groups.

6:1.B) **Characteristics of a National Policy.**

The United Nations Coastal Area management and Development Handbook highlights the following characteristics of a national policy.

1. The policy should have a significant measure of political support. In the formulation stage it should involve wide ranging consultation with citizens groups, universities and research groups, and business and commercial interests.

2) The policy must be stated in a clear, simple and intelligent form. This is an important consideration which is essential for eliminating confusion, inadequacies and inconsistencies in programme operations.

3) The policy should be logically consistent and economically sound.

It should be borne in mind having taken the above into consideration that there are several steps which should be followed in developing the policy. These are outlined below.

The policy making process should be developed in a systematic and coherent way. Jamaica must first decide what it wants to do within the coastal zone. With this consideration the definition phase of the policy should address the following questions:

a) Given the nature of the Jamaican environment what are the priorities?

b) Which resources are to be managed?

c) What is special about the area or resource?

d) What information is needed to make a management plan?

d) What are the costs and benefits of these policy objectives?

e) How does the relevant authority propose to get there?

Based on deduction, this represents the policy formulation phase as posited by Sorensen, et al. 5. It should be noted also that all of these questions deal with the appropriateness of objectives and similarly addresses strategies and cost.

As was pointed out in chapter three. some of the major problems affecting Jamaica relate to soil erosion, urban run-off, flooding, pollution from agricultural domestic and industrial sources and the destruction of ecologically sensitive areas.
The real issue lies in controlling development activities which have a deleterious effect on marine life and the ecosystem. In this regard one of the specific problems is to protect ecologically sensitive areas such as coral reefs and mangrove swamps in an attempt to foster sustainable exploitation of the living resources of the sea and to monitor development activities within the zone, to eliminate the conflict of use and to preserve the ecologically sensitive balance.

The broad objectives of a national integrated coastal zone management policy for Jamaica could be outlined as follows:

a) To promote the rational use and management of the coastal and marine resources of Jamaica.

b) To foster a commitment to the concept of sustainability.

c) Development of greater co-ordination for environmental management through an effective overall institutional framework.

d) Integration of the environmental dimension at all levels of policy development, planning, and project implementation in the activities of both the public and private sector.

6:2) Definition of Management Boundary.

In proceeding from the broad policy objectives to the specific operational concerns due consideration must be given to the establishment of a management unit of appropriate size and structure. In giving recognition to the extended resource jurisdiction of the coastal area it is also relevant to take into account the resources within the economic fisheries zone.
Essentially, from the resource related perspective a coastal area management objective may be regarded as an instrument of ocean management. In this case, Jamaica needs to clearly establish what it wants to do within the zone.

A coastal zone boundary should be broad enough to cover the issues outlined in the policy. However, it should not be too broad to the extent that it cannot be managed under the administrative structure established. In this case it is important to define and classify the area before attempting to manage it. If both marine and land based resources are to be managed the seaward and landward limits should be clearly defined.6.

As was indicated in chapter one, the coastal zone has been conceptually defined in numerous forms. However, the definition of Ketchum was considered to be the most comprehensive. Therefore, the writer found it most useful to be adopted for this research.

He conceptualizes the coastal zone "as a band of dry land and adjacent ocean spaces (water and submerged land) in which ecology and use directly affects ocean space ecology".7. This definition identifies the essential interactions of the coastal ecosystem which must be managed in order to adopt a wholistic approach to coastal zone management.

The coastal zone of Jamaica is delineated on the landward side by the 30 m contour and on the seaward side by the furthest extension of the continental shelf. (see figure 6) This definition takes into consideration a seaward component which must of necessity be included in any comprehensive management plan.
However, the argument by Sorensen that the entire land area of some small island states such as Jamaica could be considered a coastal area cannot be ignored. In this connection, it may be necessary to adopt some particular management strategies which take into consideration those parts of the coastal area which are most appropriate for intensive development, those areas not suitable for development and finally all other parts which fall between those two categories and are suitable for controlled development. In this regard, a system of zoning would be most appropriate.


Having satisfied the above considerations, the next step in the process is to decide on the most suitable strategy to be devised for realizing the objectives. It should be borne in mind that the strategies to be adopted should be oriented towards achieving the policy objectives.

6.3.1. Sustainable Use.

The legislation should recognize the linkage between the protection and maintenance of ecological processes and the sustainable uses of living resources. Explicit reference to the objectives and concepts of the World Conservation strategy may reinforce the legislation and its effectiveness.

6.3.2. Institutional Arrangements.

To achieve the policy objectives it is important to establish a unified organization for the exploitation and management of the coastal zone.
A next step is to formalize the most suitable institutional arrangement that will effectively translate the objectives into action. The previous chapter asserted the view that given the nature of integrated coastal zone management the existing Natural resources Conservation Authority was unsuitable to carry out the task based on the inherent structural weaknesses. It was therefore recommended that a new Agency with a broader mandate, and more clearly defined functions should replace this Authority.

This Agency would pursue a multifaceted approach, allowing institutional collaboration and promulgation of legislation and information dissemination. If Jamaica is serious about integrated resource management then this is the approach to be taken. After consideration was given to the need for vertical and horizontal integration, cooperation and consultation among the various government agencies, statutory bodies and resource users, it was felt that such an organization lends itself to facilitating and coordinating the implementation of policy objectives.

6:3.3. Education, Communication and Training.

Training may be defined as a process which embodies teaching and learning. It is concerned with the acquisition of capabilities or the maintenance of existing capabilities.

In reference to training need in less developed countries Mitchell (1982) argued that these countries often lack trained and well informed personnel capable of formulating, administering and managing coastal programmes.
This commentary is quite applicable to Jamaica. Chapter five pointed out that the lack of environmental education and public awareness on environmental issues and matters in Jamaica has contributed to the present environmental problems. This clearly emphasizes the need for environmental training and public information throughout the country in general.

The new Agency should of necessity allocate a special fund for training and development of staff. It should explore all the possible sources of funding and training programmes that can be obtained through regional and international agencies.

There are a number of coastal related programmes which are available to employees in this field. Fellowships for training can be sought from The Canadian International Development Agency, The World Maritime University, The Dalhousie University in Halifax, Canada, The Commonwealth Secretariat, The United Nations Environmental Programme (UNEP), The International Maritime Organization and several other Agencies. One needs only to liaison with these organizations which are eager and willing to assist developing countries in their quest for integrated coastal zone management.

Apart from obtaining external training for staff, the new Agency needs to build its own internal training programmes comprising short and long term training.

There are various methods of training which can be utilized.

1) Simulation.

This method is considered to be costly but it is a rather
effective learning tool. A long term investment in this method would be very beneficial and rewarding for it exposes learners to a model situation which prepares them in a practical way to function in the real situation when the time comes.

2) Lectures and Seminars.

The above methods are very useful and cost efficient. This is so owing to the fact that less manpower can be utilized in the process while involving a large number of staff in the training.

3) On the Job Training.

On the job training and refresher courses are also important. Nevertheless, this method should not be adopted as the main training programme. Formal training is a prerequisite for job effectiveness.

The former should be designed for managerial staff. The latter would comprise professional training programme to produce high level manpower and expertise for high level research and development.

The United Nations and it's Regional Commission and specialized agencies can play an important role in securing resources and coordinating training at all levels.

While recognizing the importance of training the human resources within the administrative structure, the Agency needs to realize that the education of the wider society is also important. A mechanism should be established to facilitate ongoing public education programmes utilizing the school systems, the press and electronic media and the Jamaica Information Service, and audio-visual materials.
Together these methods ensure that resource users are fully aware of the consequences associated with certain activities.

The law alone cannot enforce common interest. It principally needs community knowledge and support, which entails greater public participation in the decision making process. People cannot be expected to comply with a management programme unless they know that it exists, develop an awareness of the effects that it should have on their activities and believe that it will benefit them in some way, or that the costs of infringing on the plan will exceed the likely benefits. Education should seek to achieve the greatest possible user cooperation and support for management objectives.

This process of public education is therefore important to rescue the coastal resources from the similar catastrophe known as "the tragedy of the commons".

6:3.4. Legal Framework and Regulatory Process.

Before considering the drafting of new legislation, an inventory should be taken of all coastal area related activities, all the provisions applicable to the area and all related set-ups. After the inventory, the relevant laws should be classified and evaluated in respect to the basic objectives to be achieved. This examination should also establish the adequacy of all the existing laws and of the administrative capability to translate the goals into action.
There are two other available options which may be considered. A decision may be taken to draw up self-contained coastal management legislation which supersedes all existing applicable laws in the area as far as resource management is concerned; or alternatively a decision may be taken to amend all existing laws by filling the gaps, removing conflicts, consolidating laws and coordinating legislation. The end result of both is to provide an adequate and coherent legal basis for the implementation of the objectives. Based on the Jamaican situation, the latter option is preferable taking into consideration the fact that the laws governing coastal resource management in Jamaica are outdated and "toothless".

At the national level it is also advisable to establish a general legal framework for coastal management within which the policy makers, planners and executors may work.


Sorensen, et al, (1984) list 11 strategies for achieving effective coastal management. As a result of the paucity of time only the principal strategies which should be pursued by Jamaica will be highlighted.

6:4.1. Land Use Planning.

In order to accord the proper treatment on the basis of resource capacity some form of zoning should be considered by the Jamaican government. A general measure is to classify the coasts according to acceptable level of use. The United Nations Coastal area management and Development Handbook has classified the coasts in the following three categories.
a) Areas well suited for intensive development. These are areas which have elevations, soils, topography and other physical conditions favorable to development and are not considered to be environmentally fragile.

b) Areas which have overriding ecological, hydrological, physiographic or historical importance. Examples of such areas are submerged grass lands essential to the propagation of fisheries, mangrove swamps, coral reefs, selected estuarine beaches suitable for recreation with appropriate public access and areas of historical and archaeological importance. These areas are appropriate for inclusion in nature reserve and parks.

c) Areas which fall between the two categories.

The above are those areas of the coastal zone that are absolutely critical to regional ecological integrity, but because of their physical character they provide buffer zones and represent retention of use options for future generations. This category may include flood plains, aquatic preserves, aquacultural areas, river flood plains, marginal lands, forest and game management areas.

The basis of land use planning as highlighted by Lawrence Hilderbrand can be summarized as follows: under 12.

a) To promote and protect the future wellbeing of permanent residents and communities by conserving the natural environment and traditional uses.

b) To identify viable alternatives for the most prudent future uses of the land and its resources.
6.4.2. Environmental Impact Assessment (EIA)

Environmental Impact Assessment is an important technique for ensuring that the likely effects of new development on the environment are fully understood and taken into account before the development is allowed to go ahead.

Peter Bartelemus highlights the following as some of the possible benefits of an EIA:

a) It is a convenient way of introducing integrated management at the start of a project.

b) It provides a project level focus on issues which might cause conflicts.

c) It aids in the identification of significant resource interaction.

d) It allows changes to be made in a project design before its implementation.

e) It can provide recommendations for the acceptance or rejection of the project.

g) It can provide a prediction of the magnitude of the impact and indicator and of the total impact for the project and for alternatives.
Given the existing spatial conflicts within the Jamaican coastal zone it is perceived that such a strategy offers a solution to resolving conflicts and minimizing developmental impacts on the fragile coastal resources. It is therefore, recommended that an environmental review department be established by law within the new Agency whereby all proposals for development in the coastal area are subjected to a full evaluation of the net economic and social benefits accruing to society from the proposed project. This review department should develop review guidelines for the preparation and review of the EIA statement.

The Environmental Assessment Guide of the Welsh Office Department of Environment in Aberdeen, Scotland lists the component of an EIA statement as follows and which could be adopted by Jamaica or tailored to suit the environment:

1. A description of the development proposed. comprising information about the site and design and size and scale of the development, proposed actions and alternatives.

2. A listing of indicators, as well as methods used to determine their scale of magnitude and relative weight.

3. The data necessary to identify and assess the main effects which that development is likely to have on the environment.

3. A description of the likely significant effects, direct and indirect, on the environment of the development, explained with possible reference to its possible impact on

* human beings
* flora and fauna;
* soil, water and air.

* Climate, landscape, the interaction between any of the foregoing;

* Material assets;

* The cultural heritage.

4. Where significant adverse effects are identified with respect to any of the foregoing, a description of the measure envisaged in order to avoid, reduce or remedy those effects.

6:4.3. Data Bank./ Coastal Atlases.

Reliable and trusted information is crucial to the resolution of environmental conflicts. Despite this growing reality the coastal zone management programmes of many developing countries including Jamaica still lack an adequate environmental knowledge base. The new Agency should include on the priority list the formulation of a body of research which can assess the overall impacts of development activities on the fragile coastal and marine ecosystem.

A very comprehensive and inexpensive method of collecting data is through Geological information Systems. (GIS). This system is a data handling tool for mapping and retaining data. Based on a discussion with Professor William Ritchie, Vice Principal of Aberdeen University, Scotland, during the writers on the job training, he highlights the following as the major advantages of GIS system.

a) It provides a baseline data from which to work from and also has the capacity for receiving and storing additional data.

b) It is an inexpensive software programme in which land use maps can be superimposed on the video image. This feature makes storage retrieval very easy.

c) It is a permanent data base.

e) Data can be easily accessed and accumulated.

Apart from GIS systems there are several other data gathering techniques which can be used such as surveys, mapping, photographing etc. These could be used as a start, but a long term investment in this system would far out weigh the benefits to be accrued.

6:5 Programme Implementation and Evaluation.

Having laid the required foundation, the next step is for the organization to implement and Evaluate the management programme. The new trust for Jamaica is integrated management and exploitation of the resources. As was indicated earlier management programmes are best implemented in a stepwise manner. Every thing should not be done at the same time. Various components of the programme should be implemented in a logical sequence. Figure twenty four (21) as adopted from Cesna MC Cain illustrates one possible way of implementing coastal zone management in a developing country.
As can be seen from the table policy development and public consultation should be attempted first. Actual programme implementation should only occur after the various stages outlined have been completed. For the Jamaican situation this is the implementation time table that the new Agency should be guided by.

### TIMETABLE FOR IMPLEMENTATION OF INTEGRATED COASTAL MANAGEMENT PLAN IN JAMAICA

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
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<tr>
<td>Policy Development</td>
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<td>Public Consultation</td>
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<tr>
<td>Conflict Assessment</td>
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<tr>
<td>Institutional Analysis</td>
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<td>Data Collection</td>
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<td>Data Analysis</td>
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<tr>
<td>Project Formulation</td>
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<td>Institutional Reorganization</td>
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<tr>
<td>Legislation Formulation</td>
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<td>Education and Training</td>
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<td>Programmes Implementation and Management</td>
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<td>Monitoring</td>
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<tr>
<td>Evaluation and Restructuring (if Need be)</td>
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</tbody>
</table>

Source: Adapted from Casner Mc Cain
References For Chapter Six

2. Ibid
3 Ibid
5 Ibid
6 See One.
7 Ketchum The Waters Edge.
8 McCain. As at one.
9 Ibid.
10 Ibid
12 United Nations Handbook
13 Bartelemus P Environment and Development.
14 Ibid
Chapter Seven.

Summary And Conclusions.

Review Of Some Of The Prescriptions.

It was clearly established already to the extent that it should become apparent that the causes of the existing environmental degradation in Jamaica are many and varied. Equally many and varied have been suggestions put forward for her cure. For brevity, some of the salient remedies suggested will be outlined.

The study was based on the major premise that the misconception that nature's gifts are infinitely inexhaustible has fostered the pursuit of development without consideration of the present and future consequences of such action. This philosophical misconception as regards resource use and exploitation has resulted in the pollution of coastal waters, beaches, and coral reefs from urban runoff, sewage disposal and industrial effluent and construction activities. Productive wetlands areas and mangrove forests are subject to clearing for agricultural, aquacultural and landfilling for construction in response to the growing urbanization.

The tourist industry which accounts for 25% of the islands gross national product is among the chief contributors to the degradation of the coastal zone by virtue of its concentration along the narrow coastal strip and its dependence on marine related activities.
Industrial and agricultural activities have also adversely affected the coastal and nearshore environment. For example, the ten documented point sources which discharge effluent into the Kingston Harbour have contributed significantly to the loss of marine life, while agricultural run-off of fertilizer and pesticides are the causes of euthrophication, choked reefs and fish kills.

The growing urbanization in coastal areas has caused excessive stress on the existing infrastructure and in some instances has produced overcrowding and the establishment of squatters zones.

The research revealed that the development problems which have ensued reflect poor land use practices, which in turn reflect the poor general understanding of the nature of land and the sensitiveness of its resources.

The writer strongly contends that another major cause for the existing degradation is the poor institutional arrangements and the weak legislative base governing resource management. The legal system appears to be increasingly anachronistic regarding the needs of the coastal zone. This situation warrants immediate remedial action with a general perception that is oriented towards arresting the rapid decline in the quality of the coastal and marine environment, consequently ensuring a sustainable balance in the ecosystem.
Current legislative measures are inadequate in addressing directly the land sea interface of the coastal area. This has led to the overlapping of responsibilities among the various agencies and to a great extent confusion in the application of various regulations. The great secrecy in which environmental programmes were carried out also epitomizes the rivalry which exist among these agencies.

This study therefore, purports that the existing laws need to be reviewed with the object of establishing clear organizational lines of responsibilities, authority and accountability.

It was also recommended that the government should begin the elaboration of an overall policy on the management, use and conservation of the coastal zone and its resources. Ideally such a policy should address coordination with resource users, management of coastal lands and catchment, planners and developers, non governmental agencies and the public at large. The process of creating the policy will assist in balancing and addressing and eliminating user conflicts which presently exist.

As a solution to the problem of administrative coordination, the study has gone further to recommend a suitable organizational structure and also to establish an alternative strategy which should be used to realize integrated resource management. This was considered necessary as it is felt that the current National Resource Conservation Authority NRCA) has lost its credibility. Therefore, a new organization with an enlarged mandate encompassing the land and sea interface is a necessary requirement. The proposed institution consist of measures for the harmonization of existing institutions, coordinating mechanisms and legislative review.
Another matter which was addressed relates to the direction that the government should pursue in the quest for integrated coastal zone management. The principal management strategies proposed are land use planning including zoning of the coastal area according to the most suitable use, the creation of a data bank utilizing GIS systems. Environmental Impact Assessment and supplementary environmental guidelines to supplement these measures and active participation in regional and international fora. It was strongly emphasized that the choice of strategy should be based on thorough consideration of social, cultural, economic, technical and institutional constraints.

Finally the guiding principle should be sustainable development which meets the needs of the present generation without compromising the needs of future generations.
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