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WORLD MARITIME UNIVERSITY

Malmö, Sweden

**LEGAL AND ORGANISATIONAL CONSIDERATIONS
FOR PREVENTING MARINE POLLUTION DURING
SIHANOUKVILLE DEVELOPMENT**

By

SIDETH MAK

Kingdom of Cambodia

A dissertation submitted to the World Maritime University in partial
fulfilment of the requirements for the award of degree of

MASTER OF SCIENCE

in

**GENERAL MARITIME ADMINISTRATION
AND ENVIRONMENT PROTECTION**

1998

DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

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

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ABSTRACT

Title of Dissertation: Legal and Organisational Considerations for Preventing Marine Pollution During Sihanoukville Development.

Degree: MSc

The study investigates the management and strategic planning for preventing marine pollution in Sihanoukville, Cambodia. The initial chapters consider the natural marine resources and concepts of sustainable development in Sihanoukville area.

The later chapters of the study looks into the effects and hazards pollution and its effect to marine life and human health. The problems brought about by industrial developments and rapid urbanisation were also investigated and identified in this study.

Furthermore, the paper also considers the present regulatory functions of government agencies and the role of private individuals and entities concerning these pollution problems. Steps and possible solutions for the prevention of marine pollution by all those concerned have also been discussed.

The concluding chapter of the study embodies the conclusions and recommendations needed for the proper establishment of a management framework for the regulatory authority concerning marine and environmental protection in Cambodia.

Keywords: Investigate, Marine pollution, Identification, Problems, Prevention, Solution.

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
Cambodia	Kingdom of Cambodia
CDC	Council for Development of Cambodia
DACS	Department of Agriculture and Consumer Service
DCA	Department of Community Affairs
DHRS	Department of Health and Rehabilitation Service
DOC	Department of Commerce
DOS	Department of State
dwt	Dead Weight Tonnage
EEZ	Exclusive Economic Zone
FAO	Food and Agricultural Organisation
FCCC	Florida Coastal Co-ordinating Council
FCMA	Florida Coastal Management Act
FDEP	Florida Department of Environment Protection
FDOC	Florida Department of Commerce
FKNMS	Florida Keys National Marine Sanctuary
FKNMSPA	FKNMS and Protection Act
FMFC	Florida Marine Fisheries Commission
FS	Florida Statute
GDP	Gross Domestic Product
GWFC	Game and Fresh Water Fish Commission
ha	Hectare
MIME	Ministry of industry, Mines and Energy
MOE	Ministry of Environment
MOEYS	Ministry of Education, Youth and Sport
MOT	Ministry of Tourism
MPWT	Ministry of Public Works and Transportation

MRD	Ministry of Rural Development
NOAA	National Oceanic and Atmospheric Administration
OCDI	Overseas Coastal Area Development Institute of Japan
OSDS	On-side Sewage Disposal System
ppm	Part per million
RGC	The Royal Government of Cambodia
SYSAV	South Scania Solid Waste
UNDP	United Nation Development Program
UNTAC	United Nation Transitional Authority in Cambodia
WB	World Bank

Chapter I

INTRODUCTION

The Kingdom of Cambodia is located in Southeast Asia. Cambodia has a 435 km coastline on the Gulf of Thailand. Three administrative provinces make up this coastline; they include Koh Kong which is bound on the West by Thailand. Sihanoukville is located on the centre of the coastline and Kampot at the South East by Vietnam. Temperatures range from 20°C to 36°C (60-97°F) and humidity is consistently high (see Figure 1).

The coastline of Sihanoukville has great regional significance in ecological and economic terms. Production, manufacturing, transportation, foreign relationship and trade have been affected due to the long period of political instability in this area. After the UN-supervised elections in 1993, the environmental issues were immediately considered as the main area requiring rehabilitation and development in order to protect and enhance the environment and to manage and promote economic development in a sustainable way.

Sihanoukville is designated as a major region for economic development in the future. Development of infrastructure is intended for the manufacturing and tourism sectors. Unsustainable developmental activities means environmental degradation of these areas. Pollution may relatively increase, so a great emphasis is focused on living resources, its hazard for human health, and its worsening of sea water quality

and reduction of amenities. All of these result from domestic and industrial wastes, and the wastes from other activities introduced to the marine environment by human beings.

Focusing on marine pollution from land-based activities is becoming increasingly important for the national and international communities to address. The greatest threat to the marine environment is perceived to be marine pollution. Wastes discharged from ships, as well as urban, agriculture and industrial effluent from land-based sources, were known as factors contributing to the significant reduction in health and quality of the marine environment.

Although marine pollution is still considered as a major cause of concern, it is now recognised that other human activities, including large-scale commercial fishing and extensive modification of coastal environments may have a great impact on the quality of sea water. Land-based pollution is considered to be the major source of pollution of the marine environment, and was addressed by the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992.

In relation to these matters, Cambodia needs to establish national policy, a management plan and legislation for marine environmental protection to prevent, reduce and control such effects.

This dissertation looks into the much needed management and legal structure to ensure appropriate actions are proposed to protect the marine environment against pollution while needed developmental activities proceed in Sihanoukville. Efforts must be initiated to analyse the major threats from land-based activities to the coastal and marine environment by government agencies and the general public. The analysis is intended to contribute a greater awareness and understanding of the impact from the human activities on land activities effects on the diversity of life in

the marine environment and human health. The consequences of unmanaged development can reduce production in the coastal area and which will eventually effect the national economy.

Some difficulties were faced during the writing of this paper. This was mainly due to limited availability of current data and information with respect to the situation in Cambodia. Various approaches were used to seek adequate information including documentation and information collected during field trips, seeking assistance from visiting professors, research into relevant publications from the World Maritime University's library and regular consultation with the supervisor as well as discussions with colleagues.

This paper shows the necessity of setting up the organisational and legal framework to take responsibility for marine environmental protection and to ensure that the multi-use of resources and economic development should be done in a sustainable manner.



Figure 1
Source: World Bank, 1995

Chapter II

ECONOMIC AND ENVIRONMENTAL IMPORTANCE OF THE SIHANOUKVILLE MARINE AREA

2.1 Economic Sectors

The utilisation of global resources is needed for the survival of mankind. Economic development in Cambodia is based on existing natural resources. Long term positive economic development needs to be carried out in a sustainable manner. Human activities in the coastal area can affect and damage the marine environment; these activities include agriculture, fisheries, industrialisation, urbanisation and tourism.

2.1.1 Agriculture

Rice

The main agricultural crop of Cambodia is rice. The agricultural area in Sihanoukville (Kompong Som) is approximately 22,670 hectares (based on Land Sar images from the Cambodian Land Cover Atlas UNDP-FAO, 1992-93) and accounts for 26 per cent of the total area of Sihanoukville (Vichet, 1996). An estimated 12,300 tonnes of rice was harvested from an area of 9,500 ha (Monyneath, 1996)

Rice production in Sihanoukville is reported to be sufficient for only the population in this area. Decreases in production sometimes appears to be due to a decline in cultivated and harvested area, droughts and floods (Vicheth, 1996).

In the region of Sihanoukville they produce not only rice, but there are also other subproductions such as corn, black pepper, pineapple, and durian in Prey Nup and Stung Hav Districts, and Mittapheap Khan.

Mangroves

Mangrove forests existed in Sihanoukville, in total some 13,000 hectares (Land Sat, 1992 in ADB, 1996). However, these statistics are not regarded as necessarily accurate because of the different techniques used in data collection (Vicheth, 1996). These mangrove forests provide the following:

- Wood for construction and energy. (The production is in the form of fuelwood and charcoal.)
- food and shelter to organisms; mangroves also provide habitats for the life cycle of important plant and animal species;
- Mangrove areas can be used in support of recreation and tourist activities. (Camele Bann, 1996).

2.1.2 Fishery

The fishery sector plays a major role in the national economy. Fishery production is estimated to be 5 per cent of GDP (World Bank, 1994). About 10 per cent of the coastal inhabitants are fisherman. During 1983-86 the marine fisheries research group of scientists from the former Soviet Union identified fisheries resources in the EEZ. These scientists estimated that there was a marine fish stock of about 50,000

tonnes in Cambodian waters, of which only 20,000 tonnes are allowed to be exploited annually (Dara, 1997). The production can be attributed to the availability of an external market.

2.1.3 Port

Cambodia has two main ports; a river port is located in Phnom Penh and a sea port in Sihanoukville. The sea port is situated on the Gulf of Thailand. Sihanoukville Port was constructed in 1956 and is the only port with deep water berths in Cambodia. Current construction proposals call for a design depth of water at the quay wall to allow 20,000 dwt vessels to come alongside. Today, it allows for 10-12,000 dwt ocean-going vessels.

The port provides seven berths for ocean-going vessels, five large warehouses, ship repair activities, an oil terminal and a rail way link to provide transportation to Phnom Penh.

From the year of 1979 to the end of 1988, when Cambodia was still a socialist state, all ships came from socialist countries and were allowed to dock in Sihanoukville. During the first half year of 1989, the port of Sihanoukville was open to use for other foreign ships and trade began with Singapore, Hong Kong and Japan (Vicheth, 1996).

Since 1989, the imports and exports of commercial trade have been gradually increasing. This corresponds to increasing industrial and agricultural productions and provide opportunity for the port to make increased profits from marine transportation.

2.1.4 Industry

In 1994-95 the policy of the Royal Government of Cambodia (RGC) was to promote a moderate growth of industrial and artisanal activities and a rehabilitation and a reconstruction strategy for the country. Free market reforms and new management systems were introduced. The RGC paid more attention to the economy of the coastal areas having industrial and artisanal production in order to increase demand of the domestic market and promote the dynamic tourism sector (Vicheth, 1996). In the past, some small factories and plants were constructed in Sihanoukville, namely a brewery, a fish sauce factory, an oil and gas refinery and storage facilities, an ice factory, a saw mill and plywood factory (Monyneath, 1996). At present, due to lack of financial and technical assistance, some of the factories are not operated. These still in operation are the brewery, the fish sauce factory, the ice factory, and the plywood factory.

It should be a policy of the RGC to further develop this sector. This would result in creating employment for the unemployed as well as an impact on the economy.

2.1.5 Tourism

Cambodia is a small country in Southeast Asia, but it is rich in both natural and cultural tourist attractions. Many tourists come from other parts of Asia, Europe, Australia and America specifically to visit the culture and nature of Khmer (Cambodia). There are many attractive areas in the provinces including coastal regions.

Coastal tourism is located in three provinces: Kompot, Sihanoukville, and Koh Kong. The total length of the Cambodian coastline is approximately 435 km (First State, 1994). Currently, the beaches and the national park in Sihanoukville provide a

major income from tourism. At present, the tourism demand in Sihanoukville is dominated by locals, NGO personnel and foreigners working in Cambodia (Tourism, 1997).

In 1994, 13,086 tourists visited the province somewhat exceeding the estimate of the Sihanoukville 5-year plan. Most of these were locals and about 4,300 were foreigners. The number of tourists was expected to increase by about 24 per cent in 1995 (Tourist, 1997).

The government has targeted for development of the tourism sectors along the coast of Sihanoukville. The development of tourism is expected to decrease unemployment, generate income, contribute to the gross domestic product, and generate foreign exchange and government revenues.

2.2 Areas or Resources of Environmental Importance

The coastal area provides a variety of resources both on land and in the water. The landscape holds the potential for profit by attracting visitors. In that it might be damaged or destroyed by inappropriate visitor activities; it should be protected and prevented from damage for future generations.

2.2.1 Beaches

A primary objective of tourists is often travelling to participate in the beach activities of Sihanoukville. Sihanoukville is blessed with 40 km of beautiful white sandy beaches and a calm sea, another 20 km of sandy beaches are available if considering the 40 islands offshore (Tourism 1997).

There are several beaches which are most developed and these include Ochheuteal, Sokha and to a lesser extent the Independent Hotel beach. Other beaches are the Governors and Ream beaches. All the beach areas are narrow with a limited sand area and high tides. At present these beaches are in need of widening (Tourism, 1997).

2.2.2 National Park

Sihanoukville has one existing national park. This national park is named Preah Sihanouk National Park or Ream National Park. It covers an area of about 1,500 hectares. Preah Sihanouk Park is under the responsibility of the Ministry of Environment (MOE) through the direct control of the Provincial Department of Environment (Vicheth, 1996). Preah Sihanouk Park is to be linked to tourism development. To the east and west of the town there are other nearby scenic areas of importance. These can be developed for excursions and nature preserves (Development Strategy of the Cambodia Coast, 1996).

The national park is an important natural resource and of scientific, educational and recreational value, and is comprised of a relatively large area (ADB, 1996): It holds one of several ecosystems which as yet has not been materially altered by human exploitation and occupation.

The park contains plant and animal species, geomorphological sites and habitats of special scientific and educational interest within a natural landscape of great beauty.

The authority of Cambodia has taken steps to prevent or eliminate, as soon as possible, exploitation or occupation within the whole area and to enforce effectively respect for ecological, geomorphological and aesthetic features. Visitors are allowed

to enter, under special conditions, for inspirational, educational and recreational purposes.

2.3.3 Fisheries Resources

In coastal zones high biological productivity exists as well as important nurseries for fish breeding along the coast of the Kingdom of Cambodia. There are about 435 species of fish from 97 families which have been identified by scientific expeditions from 1959-69. However, the Cambodian government has an important role to play in the protection of fish stocks in the Cambodian sea waters (MOE, 1997). Therefore, conservation of biodiversity is one of the principle objectives of the protected areas system; establishment of the system is most important for maintenance of biodiversity in order to serve scientific research, tourism and other purposes.

2.2.4 Coral Reefs

The coral reefs provide an area of high productivity for the marine ecosystem. They are found surrounding the islands in the Cambodia Sea, which is home to some of the many species of coral such as Sarcophyton, Dploria, Pocillopora, Fungia, Hydrophora Rigida, Moutiphore Aequituberculata, Favita, and Platygura (Monyneath, 1996).

The marine natural resources are important for the ecosystem. To provide for the need of future generations, they should be used in a sustainable manner.

Chapter III

STATUS AND PLANS FOR ACTIVITIES IN SIHANOUKVILLE THAT HAVE POTENTIAL FOR POLLUTION

3.1 Present Economic Activities

At present, Sihanoukville is an important area for economic activities of the Kingdom of Cambodia. The biggest factory in the city is the Angkor Beer Factory, a semi-government company which employs some 325 workers. There are many more small-scale industries, for example, an ice-factory, a saw mill, a rattan factory and a garment factory. Recently, the number of tourist has also been on the rise. Further more, hotel constructions have increased after the elections which were held by UNTAC in 1993.

The Cambodian economy has been improving since 1989. Foreign currency is earned by export of fish and shrimp to Thailand. International trade is mostly transported by waterways. The port of Sihanoukville plays a central role in the transport of cargo.

Oil and gas refineries and storage facilities were set up in 1967. However, their operation was stopped as a result of bombing. Currently, this site is leased to the Shell Oil company for storage and distribution of oil and gas.

3.1.1 Urban Environment

Sihanoukville is an essential part of the national economy. An estimated 58 per cent of the population lives in the rural areas, with the population of the urban centres growing rapidly. Table 1 and Figure 2 show the increase in population in Sihanoukville. Because of an inadequate infrastructure, the demands for expansion of the settlements are steadily increasing. Urban run-offs from roads, construction sites, vehicles, packing places and other paved areas contain a wide variety of contaminants, including oil and grease, sediment, bacteria, organic matters, nutrients and metals. If appropriate measures are not taken, urbanisation is expected to cause a severe strain on the city and the coastal environment.

Wastewater Management

From the residential and industrial areas along the coast of Sihanoukville city, solid and liquid wastes are discharged into the river and carried to the sea directly. The organic residues are discharged from the agricultural and agro-industrial plants in the suburbs of this coastal city into the coastal waterways that run into the sea. The breakdown of this organic matter causes reduction of oxygen levels and may cause the death of marine animals which require a high level of oxygen in the water. The marine environment can also be polluted by toxic substances within the wastewater.

Facilities which provide water, electricity and sewage treatment are insufficient, especially with the increasing population in the coastal region. The drainage system in the city was constructed during the French colonial days. This system does not include waste treatment. Due to a lack of upkeep and neglect by the authorities in the region, the sewage system of many residential settlements, hospitals, restaurants, resorts and factories are not connected to the central sewage system.

Solid Waste Management

Solid waste in Sihanoukville city is collected by a single ageing truck, the responsibility for which lies with the Department of Public Works. The dumping site is located approximately 10 km outside of Sihanoukville city. For this service, households pay a monthly fee. The solid waste contains toxic and non-toxic materials. A variety of contaminants can find its way to river or coastal waters by rainfall. Such pollutants may cause damage to coastal marine life.

As a result of contamination of the marine ecosystem there has been a decrease in biological diversity and productivity of the marine natural resources.

Table 1: Population Estimation in Sihanoukville from 1962/95

Population (000 people)								
Year	1962	1968	1980	1987	1992	1993	1994	1995
Population	7	15	51	61	107	114	121	120

Source: Coastal Zone Management in Cambodia, 1996.

Population Growth in Sihanoukville

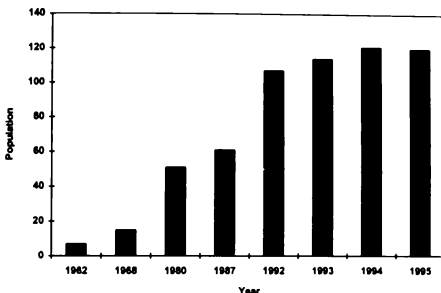


Figure2

3.1.2 Port

The Port of Sihanoukville is the only international sea port in Cambodia. Although it can accommodate vessels of up to 20,000 dwt, presently the port only allows ocean going vessels of up to 10,000 to 12,000 dwt. The port facilities consist of seven berths for ocean going vessels, five large warehouses, ship repair facilities, an oil terminal and a rail way link from this port to Phnom Penh. The port's main wharf is 550 m long with a minimum depth of 9.4 m. Other berthing facilities can accommodate vessels up to 1,000 tonnes, with a draft restriction of 7.6 m.

The Port of Sihanoukville is equipped with several cranes, and other cargo handling equipment, which are old and often lack spares; the staff and workers in the port also lack experience and basic training in port management.

Commodity for Export

At present, there are three main commodities for export: timber, logs and plywood, which account for about 87 per cent of the exports. In 1995 the volume of these commodities was 88 thousand tonnes, 28.6 thousand tonnes and 16.5 thousand tonnes respectively.

Timber has been exported since 1990 and the export of the plywood began in 1994. Other cargoes exported, although on a small scale, are natural rubber, soybean and scrap iron, and others shown in the Table 2. Since 1992, container cargo is also being handled. It has increased steadily, reaching almost 20,000 tonnes in 1995 (see Table 2).

Table 2: Cargo volume by commodity for Export from 1990/95

(Unit: Ton)

General Cargo	83,659	86,873	77,350	120,158	96,026	133,623
Log Wood	22,080	68,686	63,663	7,177	21,773	28,616
Timber	4,336	4,574	8,396	96,020	63,495	88,156
Scrape Iron	48,192	6,883	4,751	7,671	0	0
Soybean	1,164	4,822	0	0	0	0
Natural Rubber	6,923	1,240	95	492	3,086	227
Ply Wood	0	0	0	0	6,630	16,460
Machinery UN	0	0	0	5,070	205	0
Rattan	494	609	178	0	0	164
Kapok	139	32	0	0	0	0
Pepper	35	22	56	0	0	0

Fish	0	0	6,100	4,093	4,528	3,845
Others	148	5	211	3,728	837	0
Container	0	212	36,151	12,338	19,804	
Total	83,659	86,873	77,562	156,309	108,364	153,427

Source: Sihanoukville Port (1996)

Commodities for Import

Cambodia is still a developing country in the Southeast Asia region, with many industrial products being imported from other countries within the region such as cement, fertilisers, sugar, steel, bitumen, and other cargoes (see Table 3), (OCDI, 1996).

Table 3: Cargo Volume by Commodity for Import from 1990/95

(Unit: Ton)

General Cargo	182,303	44,582	171,071	209,531	281,961	273,203
cement	46,560	14,200	83,903	137,295	153,679	93,386
Fertiliser	11,439	2,038	5,499	23,898	28,437	29,808
Machinery	20,353	3,130	12,689	2,261	2,587	6,530
Rice	4,688	0	5,970	10,449	18,867	36,684
Special Goods	4,638	846	0	0	0	0
Sugar	0	2,011	0	4,294	17,410	19,898
Steel	0	0	7,446	2,570	16,115	17,936
Bitumen	0	0	0	0	10,074	19,987
Fibre	2,049	0	0	0	564	0

Others	91,484	22,357	54,994	28,764	34,228	48,974
Container	0	0	30,459	89,546	126,659	208,832
Fuels	17,766	1,095	5,112	23,119	41,684	72,243
Total	200,069	45,677	206,642	322,196	450,304	554,278

Source: Sihanoukville Port (1996)

The solid wastes ranging from general rubbish and garbage to disposed industrial materials and construction rubble pose a serious disposal problem for the port. Important sources include residential and commercial areas, industrial plants, berths, cargo handling area and warehouses. The cargoes such as fertilisers and fuel may cause pollution to the marine environment.

3.1.3 Industry

The industrial sector in Cambodia, especially in the coastal areas is relatively underdeveloped in terms of its activities and size. However, the marine environment can be affected due to the lack of assessment of pollution and control of industrial discharge into the sea.

Brewery

The locally brewed beer is produced in Sihanoukville. The brewery is constructed just outside the city on the river bank. The statistics of annual production could not be obtained. The brewery discharges water waste directly into the river. The toxicity level of this waste water is not severe, but when it enters the coastal water it impacts the marine life as a result of reduced oxygen levels in the water due to the breakdown of the organic compounds.

Fish Sauce

A fish sauce factory has been built near Sihanoukville. Its production can be purchased from anywhere around the country. The marine environment is polluted by discharging waste water mixed with washing detergents used for cleaning bottles. The contamination tends to increase the pH of the water. The waste from processed fish is usually stored in open areas. The waste finds its way to the sea, usually washed by the rains, causing nutrient enrichment of the environment leading to bloom of plankton and algae and even eutrophication.

Oil and Gas refineries and storage facilities

The refinery was set up in 1967 in co-operation with the Kingdom and a French group. The purpose was to refine imported crude oil in a facility with an annual capacity of 600,000 tonnes. It is located to the north of Sihanoukville harbour. At present, the refinery is not being operated due to equipment breakdown. The site of the refinery has been leased by Sheit Oil company for use as a storage and distribution facility for oil and gas. During operations oil leaking from pipelines finds its way into the sea. The contaminants will kill marine animals and even small amounts of oil is enough to destroy the amenity value at beaches.

Ice factory

The ice factory is run by a private company on a 7-year contract. This contract started from May 1993. The Ice factory produces about 520 tonnes of ice per month. Ice production activities have an impact on the environment. It emits gases (chlorofluorocarbon-CFC) into the atmosphere which affect the ozone layer, contributing to the warming of the environment and indirectly affecting the marine environment. The ice plant uses a lot of chemicals and oils to clean and lubricate

machines, which usually leaks from the machines. Due to lack of appropriate treatment of the waste, they end up in the coastal waters and rivers. In most cases these too have a negative impact on the marine environment.

Saw mill

The saw mill is owned and operated by a private company. Its wastewater is discharged into the sea through the fresh waterway. The chemicals which are used for treating timber are a danger to marine animals.

Plywood factory

The plywood factory is owned and operated by a Taiwanese company. It is located along the Prek Toeuk Sap river bank and national road (Road No 4). It has an area of approximately 17 ha. and employs some 400 local workers. The factory produces about 3,500 cubic meters of plywood per month.

About 90 per cent of the products are exported; about 90 per cent to China and Taiwan, and 10 per cent for local consumption. In 1994, 6,630 tonnes of plywood products were exported; in 1995 and then dramatically increased up to 16,460 tonnes in 1995. Waste water from the plywood factory contains chemicals which may also be a pollution hazard.

3.1.4 Agriculture

The agricultural economy is important for Cambodia. Approximately, 85 per cent of the population are involved in farming. About half of the country's GDP is derived from forestry sub-sectors.

Approximately 45 per cent of the population of Sihanoukville are involved in farming. Sihanoukville had agricultural land of approximately 20,000 ha. in 1992/93. It has decreased by nearly 40 per cent since 1985/87 as indicated in Table 5.

Table 4: Decrease in agricultural land in Sihanoukville

Source		Year	Estimated Area of Agricultural Land (ha)
1	Cambodia Land Cover Atlas (UNDP/FAO)	1985/87	35,300
2	Final Report of Agriculture of Sihanoukville (Sihanoukville Department of Agriculture)	1990	33,889
3	Sihanoukville Department of Agriculture	1991	22,672
4	Cambodia Land Cover Atlas (UNDP/FAO)	1992/93	20,000

Source: Coastal and Marine Environmental Management of Kingdom of Cambodia

The main crops produced in Sihanoukville are rice and corn. They are primarily grown for personal consumption. Rice production has been fluctuating over the years. In 1993/94, the production fell to 6,300 tonnes, but started to increase again in 1994/95 to 123,000 tonnes (see Table 5).

Table 5: Rice production in Sihanoukville (1980/83-1994/95)

Year	Cultivated Area	Harvested Area	Yield	Production
	(000 ha)	(000 ha)	(ton/ha)	(000 ton)
1990/91	10	10	1.70	17
1991/92	12	9	1.66	15
1992/93	10	9.9	1.21	12
1993/94	9	5.2	1.20	6.3
1994/95	9.5	9.5	1.30	12.3
AVERAGE	10.1	8.72	1.41	12.52

Source: 1990/91 to 1993/94 from Bulletin of Statistics and Agriculture Studies. Ministry of Agriculture

The marine environment can be affected by pollution from agricultural activities. This includes pollution from soil eroded from land, run-offs from farmlands contaminated by fertilisers, pesticides and herbicides, organic matter derived from livestock production units and from spreading of animal waste on land. Such activities can produce enormous amounts of pollution, which reaches coastal waters through the rainfall. The pollutants discharged into the sea will vary according to the types of activities on land.

3.1.5 Fishery

Fisheries have played a major role in exports since 1992. Virtually all marine fish stocks are currently being exploited, using unsustainable methods of fishing. This has resulted in a decline in the quantity of fish available, although fluctuating over the years. The current decline in fish production is also due to sea water contamination by the disposal of solid wastes, fertiliser and pesticide runoffs, wastewater from

households and industries and deforestation of coastal wetlands. These contaminants effect the fish breeding areas.

3.1.6 Tourism

The beaches and the islands of the coastal province of Sihanoukville attract a huge number of tourists. During weekends and public holidays, local people as well as foreigners visit these facilities.

There has been an increase in visitor arrivals in Sihanoukville since 1993. It is estimated that approximately 12,000 tourists visited Sihanoukville in 1993. These numbers increased to about 13,000 and 16,000 in 1994 and 1995 respectively. At present, there are 31 hotels and 14 restaurants. It is expected that more hotels and restaurants will be constructed with the increase in the number of tourists, (Vichet, 1996).

Pollution from tourism activities will greatly impact on the marine environment and human life. It may be caused by the discharging of sewage from hotels and restaurants and indiscriminate dumping of solid wastes by tourists.

3.2 Future Plan for Development

The Sihanoukville Provincial Government has set up a 4-year development plan, from 1996 to the year 2,000 and a public investment programme for 1996 to 1998.

3.2.1 Port Development

The sea port of Sihanoukville was built in 1956. The design and size of the port facilities cannot allow vessels of more than 20,000 dwt to come alongside.

After the government began promoting international trade, the port needed to handle larger quantities of different commodities. Therefore, the construction and development of the existing port facilities and equipment needed to be upgraded to increase capacity.(ADB and EVS Environment Consultants. Ltd, 1996).

It is for this reason that the government has decided to dredge the port as well as develop the infrastructure. The government strategy has been

- to develop an efficient and modern international seaport at Sihanoukville,
- to sustain economic growth by reducing transportation costs and securing efficient port operation, and
- to establish an infrastructure support for an industrial zone.

However, the rehabilitation plan for Sihanoukville Port was formulated by the Ministry of Public Works and Transport (MPWT) in December 1993. The estimated cost of the project is around US\$ 27 million for the construction of a 660 m breakwater, building new wharf facilities, surfacing of a container yard, and procurement of navigation buoys and radio equipment, (Development Strategy of Cambodia Coast).

The development of port, harbour and channel requires regular dredging in order to maintain sufficient depth of water for safe navigation. The contaminated dredged material from the port is dumped at sea, untreated. Such indiscriminate dumping affects marine benthic organisms living in these areas. The dumping also causes disturbances and creates imbalances in their habitat.

The marine environment is also often affected by accidents caused during normal port operations.

3.2.2 Industrial Development

In 1993/95 the policy of the Royal Government of Cambodia was to promote a moderate growth of industrial and artisanal sections as a part of the social and economic rehabilitation and reconstruction of the country.

The RGC has presented a free market and a new management on the economy of the coastal area in order to meet the increasing demand of the domestic market and the dynamic tourism sector with its industrial and artisanal productions (Vichet, 1996).

On the other hand, even when the majority of industrial establishments are small scale, it is important in that they provide employment to the local people in the coastal region. The royal government has also provided appropriate facilities for foreign investment.

Accordingly, in the Sihanoukville coastal region the pollution effects from the industrial sector is still small. Most of the small industries and artisans are found located along the streams and shoreline. According to Coastal Zone Management in Cambodia, the liquid waste is discharged from Sihanoukville's brewery direct into the coastal environment without treatment . Therefore, these matters should be considered urgent for the future.

3.2.3 Tourism Development

The target of the Government is to enhance the economic development with a priority on the development of the tourism sector. Bearing this in mind the government signed an investment project of about US\$ 1 billion to develop the tourism infrastructure on the coast, including a casino on Koh Pous (Naga Island), and up to about 2,000 hotel rooms (ADB, 1995).

The government wishes to create protected areas for recreational purposes within certain places in Sihanoukville in order to attract and provide enjoyment to the national and international tourists. However, with the increasing number of the tourists, it is expected that there will be an increase in the number of hotels, restaurants and increasing other such facilities in the coastal region.

From the point of view of the environment, tourism activities would affect the coastal region. If there are no measures, requirements and regulations for the protection of the environment, these can be lost forever through pollution.

Coastal tourism development is one of the problems to the marine environment. The environmental impacts of coastline tourism development results from two different types of tourist activities. One results from common forms of beach activities and associated developments to accommodate tourist demands. The other is related to access point for tourists. Environmental impacts on coastal marine resources include land transformation and raw sewage discharge into the marine environment, which increases the incidence of illness for bathers and causes algae blooms which spoiled the aesthetic qualities of this area. Garbage is another source of pollution which results from human activities. The disposal of solid wastes on the beaches such as food waste, paper, and other plastic materials may seriously affect marine wildlife and will make the beaches aesthetically less pleasant. The other activities include diving and entertainment on board ship which will impact directly on the coral reefs.

Chapter IV

EXISTING LEGAL AND ORGANISATIONAL FRAMEWORK

The management of environmental protection and natural resources has been controlled by binding laws from various sectors of related institutions. These laws are prepared to protect and conserve marine resources from human consumption and exploitation within the coastal areas.

4.1 National Requirements and Policy

After the election in 1993, the environmental issues in Cambodia have been considered by the Royal Government of Cambodia (RGC). The RGC established the Ministry of Environment to be responsible for the environment. In response to the requirement of the government, the ministry has set up its own objectives, a legal framework and structural organisation to undertake the responsibilities for sustainable development.

On the 1st November 1993, the Royal Decree on Protected Areas designated the Ministry of Environment (MOE) as the leadership agency for supervising the planning and development of a National Protected Area System, incorporating the protection of terrestrial wetland and coastal environment . The MOE had to prepare the necessary legislation on Environmental Protection and Natural Resources

Management. This legislation was adopted by the National Assembly on 24th December 1996.

The Law on the Environmental Protection and National Resources Management can be considered the framework for subsequent sectoral laws, decrees, sub-decrees, and regulations. It consists of 11 chapters and 27 Articles. The chapters of the Environmental Law are:

1. General Provisions
2. National and Regional Environmental Action Plans
3. Environmental Impact Assessments
4. National Resource Management
5. Environmental Protection
6. Monitoring Record Keeping and Inspection
7. Public Participation and Access to Information
8. Environment Endowment Fund
9. Penalties
10. Interim Provision
11. Final Provisions

The protection, management and enhancement of the environment, and the promotion of socio-economic development in a sustainable way are the main objectives of the Environmental Law. In order to protect, conserve, and manage the coastal zone and marine resources in an efficient manner, laws and regulations have been stipulated, as a general framework for the whole of the country (Vicheth, et al ,1998). The principal laws are as follows:

Law on Investment in Cambodia

This law was passed in August, 1994 by the National Assembly. The Law established a Council for Development of Cambodia (CDC), to be responsible for any oversight on investment activities.

Aspects of the law which directly regulate environmental management include the following: The council should review and approve, and provide a decision within 45 days, while the investors submit their investment applications. CDC also has the power to withdraw the right and benefits granted to the investor, where he/she does not comply with the conditions stipulated by CDC. Incentives should be made available by the RGC to encourage investment in the tourism and environmental protection sectors.

Law on Land Management, Urbanisation and Construction

This is an important law for the development of the coastal and marine zones. It was passed by the National Assembly and came into force on 24th May, 1994. The objectives of this law are to promote the improvements of urban and rural areas within the coastal provinces of the Kingdom, in order to ensure sustainable development with respect to public and individual interests, private rights and others and controlling construction; ensuring sustainable development among urban and rural areas in accordance with the geology, and specification of each rural zone; ensuring the viability of national resources, cultural properties, and sustainable development of economic and tourism sectors, while preserving environmental quality.

National Mining Law and Mineral Agreement

The Mining Law was submitted to the council of ministers in November 1994. The purpose of the law is to define and control various types of mining surveys, exploratory mining and operational mining of gemstones, minerals and quarries. In accordance with this law, the Ministry of Industry, Mines and Energy (MIME) is responsible for mining permits and control. All mining activities should comply with the law and would be subjected to the environmental protection requirements. Before the start of mining activities and during the operation, an environmental protection plan should be prepared.

In addition to the law, a standardised mineral agreement has been prepared by the MIME, to which MIME and permittees would be party. Agreement would contain environmental safeguards as required by the mineral law.

National Protected Area System Sub-decree

The objectives of this sub-decree are to strengthen the authority and mechanism for planning and developing a National Protected Area System. It should incorporate the protection of terrestrial, wetland and coastal management. The sub-decree was submitted in November 1993.

Law on Environmental Protection and Natural resource Management

The Law on Environmental Protection and Natural Resource Management was submitted to the council of ministers in August 1995 for review and consideration. This is a relatively new requirement and also important for coastal zone and marine management in the Kingdom. This law is generally established over other laws and

legal instruments related to the protection, conservation and management of the natural environment.

The objectives of the Law on Environmental Protection and Natural Resource Management are as follows:

- To improve the quality of the environment by preventing, reducing and controlling pollution from human and commercial activities which might damage the ecosystem. Before the decision of the government on the proposed projects and activities, there are two items (Initial Environmental Evaluation-IEE, and Environmental Impact Assessment-EIA) which should be assessed and considered.
- To ensure that all natural resources in the Kingdom of Cambodia, including living and non-living are conserved, used, developed and managed in a rational and sustainable manner.
- To promote the participation of the public in environmental protection, and natural resources management.
- To punish individuals and entities who pollute the environment and cause environmental harm by fines, compensation and improvement.

Environmental Impact Evaluation Law-Decree or Sub-Decree

The Environmental Impact Evaluation was submitted as a paper titled “concept and strategy for developing environment impact process in Cambodia”, on 1st November 1994.

The objectives of the paper were to state the institutional responsibility for the conduct and supervision of the environmental impact assessment process, including

the details for the process and requirement criteria for environmental analysis; and documentation for future decrees or sub-decrees.

Organisational Structure for Coastal Zone Management

The management of the coastal zone is very important for the enhancement of the environment, conservation of natural resources and promotion of socio-economic development in a sustainable way. It is under the responsibility of various governmental authorities, but high priority has been given to the Ministry of Environment (MOE).

The Ministry of Environment and the Ministry of Agriculture, Forestry and Fisheries (MOAFF) are directly responsible for the environment and natural resources of the coastal areas by sharing specific areas.

In particular, the MOE has the role of protecting the environment, in a broader sense of the term. There are other resource-related government institutions, which are also concerned with the management of the coastal zone. These include the

- Ministry of Industry, Mines and Energy (MIME);
- Ministry of Public Works and Transportation (MPWT);
- Ministry of Tourism (MOT);
- Ministry of Rural Development (MRD);
- Ministry of Education, Youth and Sports (MOEYS); and
- Provincial and local authorities.

In general, these ministries have worked together, except in some cases when there has been a conflict between parties or where there has been a need to evaluate a

new project. The MOEYS plays its role by providing education related to environmental coastal management subjects.

4.2 Deficiencies in the Framework

The coastal area of Sihanoukville in Cambodia is the main centre for the economic development such as industries, sea transport, port operations, agriculture, fisheries, urbanisation and tourism.

However, the coastal zone environment of this area is considered a major issue, since the RGC was established in 1993. RGC provides high priority to the MOE to take the responsibility for the environmental protection and natural resource management. This task has not been carried out efficiently because of certain deficiencies in the framework, which include:

- lack of subordinate legal instruments;
- limiting economic situation;
- inadequate human resources;
- poor co-ordination with existing agencies.

Subordinate legal instruments

Whereas the law on environmental management stipulates the principle laws, the subordinate legal instruments lay down what measures can be enforced in a specific area. These subordinate legal instruments can regulate any human activities which pollute, damage or present a hazard to the marine environment and human health. It also provides the concerned ministries with authority to regulate all activities including urbanisation, industry, shipping, agriculture, fishing, tourist and others,

within the coastal areas in a sustainable manner. Environmental protection can be carried out with a proper management plan, based on these regulations.

Economic situation

Funding has been a major problem for producing the legal instruments and then enforcing them. The current financial support for the organisation is insufficient to satisfactorily complete the task. The marine environment is based on specific data and regulations. In order to enhance the quality of environmental protection in a sustainable manner, it requires financial support for training and research.

Human resources

Human resources development is a critical requirement not only to build up technical knowledge and capabilities, but also to create new values to help individuals and the nation cope with rapidly changing social, environmental and development realities. Lack of human resources has resulted in a slower process in the implementation and enforcement of the laws and regulations. At present, environmental protection and conservation can not be carried out properly due to the limited knowledge of government staff on environmental concepts. It is imperative that training courses on environmental protection and prevention be provided.

Co-ordination with existing agencies

The responsibility for enforcement is held by some of the main resource-related ministries. In order to achieve this the MOE needs to co-ordinate their activities. The MOE has found difficulties in the past, in trying to co-ordinate with these resource-related ministries, to achieve the immediate task. Therefore, the co-ordination among those source related ministries needs to be improved in order to achieve the

desired protection. If it does not exist, the implementation has never been carried out.

The management of the coastal area is important to protect the marine ecosystem, public health and also to improve the quality of the water within this area. In order to achieve this, management must be based on the laws and organisational framework, as prescribed by the laws on Environmental Protection and Natural Resource Management. However, as mentioned earlier, this legal and organisational framework is not fully capable of carrying out the management of the coastal area due to a lack of funding, human resources and co-ordination among the resource-related ministries. Bearing this in mind, there is a need for an upgrading in the framework, so that the environmental issues can be addressed to some satisfaction.

Chapter V

EXISTING LEGAL AND ORGANISATION FRAMEWORK IN FLORIDA (USA)

In this chapter the author describes the management and legal framework in Florida Keys, the USA and which he intends to apply in his country.

The Florida Keys National Marine Sanctuary (FKNMS) was established in 1972. The sanctuary is a significant marine environment, consisting of sea grass, mangrove and extensive living coral reefs.

Because of the tropical climate and the richness of natural resources the FKNMS has attracted a large number of explorers and tourists. Approximately 4 million people visit the sanctuary annually. The sanctuary has been considered a marine equivalent to a tropical rain forest with a high level of biological diversity. It is however susceptible to damage from human activities.

A management plan was set up with the purpose to ensure the sustainable use of the natural resources by achieving a balance between comprehensive resource protection and multiple use, compatible with the available resources.

5.1. The Needs for a Legal Foundation

The damage caused by people to the natural resources could have resulted in a significant decrease in biodiversity in the area. However, to safeguard against human exploitation, certain legal measures were needed to be put in place.

The legal framework currently in place in the Florida Keys is divided into five sections, which include:

- Coastal or resource management Authorities;
- Water and air quality authorities;
- Waste management authorities;
- Development and planning;
- Miscellaneous.

Coastal or Resource Management Authorities

Florida Environmental Land and Water Management Act

The Department of Community Affairs (DCA) holds the responsibility for the state wide planning and development of land and water management policies to ensure a water management system that both improves water quality in the state and promotes growth accordingly to the Act. The general guidelines for development activities is established by DCA (FKNMS, 1996. Vol. III of III).

The Florida Areas of Critical State Concern Restoration Trust Fund Act

The Act contains a trust fund for reimbursement of the actual cost in payment of damages for injury to, or distraction of, the coral reefs or other natural resources of the state. This fund can also be used for the other purposes including research,

protection, and restoration of coral reefs and other endangered national resources (FKNMS, 1996. Vol. III of III).

Beach and Shore Prevention Act

This Act is a regulatory jurisdiction for construction and excavation activities on coastal land. If a construction, in violation of the Act is considered as a public nuisance then it must be removed. The Act creates a “Beach Management Trust Fund” to implement state responsibilities in comprehensive, state-wide beach protection activities (FKNMS, 1996. Vol. III of III).

Coastal Zone Protection Act

This Act aims to minimise damage along the coast by mandatory use of the strict construction standards (FKNMS, 1996. Vol. III of III).

Florida Coastal Management Act (FCMA)

In accordance with this Act, the state administrator§ of FCMA play a vital role as the state’s lead agency, co-ordinating with the Florida Coastal Co-ordinating Council (FCCC) in the review of all plans and activities relating to the coastal zone and developing a comprehensive state plans for the coastal zone (FKNMS, 1996. Vol. III of III).

Florida Wetlands Protection Act

In accordance with this Act, a wetlands monitoring system was created to determine the location of wetlands and to identify the impact to and losses of wetlands. All activities in wetlands must be permitted by the state. The mangroves located in the

water is also protected by the Act, to avoid damage from dredge and fill activities. In addition, Florida wetlands regulations are used to protect coral reef, algae, sponge and seagrass communities (FKNMS, 1996. Vol. III of III).

Land Conservation Act

This act requires the state to develop comprehensive plans to conserve environmentally endangered lands (FKNMS, 1996. Vol. III of III).

Outdoor Recreation and Conservation Act

This act requires the state to develop a comprehensive multi-purpose outdoor recreation and conservation plan for the state and is authorised to get property to achieve conservation and recreation purposes (FKNMS, 1996. Vol. III of III).

Florida Communities Trust Act

In accordance with this Act, the non-regulatory state agency is the Department of Communities Affairs and Trust Fund which plays a leadership role to co-ordinate, undertake, or fund projects implementing the conservation, recreation, or coastal elements of the local comprehensive plans (FKNMS, 1996. Vol. III of III).

Water and Air Quality Authorities

Florida Air and Water Pollution Control Act

Under this Act, the state regulates the pollution of air and water by administrating and enforcing the state standards for air and water (FKNMS, 1996. Vol. III of III).

Environmental Protection Act

This Act is an injunctive relief to compel government agencies to enforce its rules, regulation or the law protecting air, water or other natural resources, and to stop persons or government entities from violating a law or regulation (FKNMS, 1996. Vol. III of III).

Florida Litter Law

This law prevents any person from dumping litter of any kind, in any manner or amount, on roads or public lands, in lakes, rivers, canals, streams, tidal waters, or coastal water unless authorised by law or permit . All law enforcement officers have to enforce this litter law (FKNMS, 1996. Vol. III of III).

Florida Pollutant Spill Prevention and Control Act

The state is provided by this Act with the authority to control the transfer, storage, or transportation of products that contain pollutants between vessels, onshore facilities and vessels, and terminal facilities within state jurisdiction. The pollutants in this Act mean oil of any kind, gasoline, pesticides, ammonia, chlorine, and derivatives, excluding liquefied petroleum gas. The discharge of any kind of pollutants (substances) is prohibited (FKNMS, 1996. Vol. III of III).

Surface Water Improvement and Management Act

The water improvement and management plans is developed to restore and maintain the water quality. The Surface Water Improvement and Management Trust Fund is available for planning and improvement (FKNMS, 1996. Vol. III of III).

Water Resources Restoration and Preservation Act

Under this Act, the state must test samples of state water and also set up restoration programs when needed (FKNMS, 1996. Vol. III of III).

Water Resources Act

Under this Act, the regional water management districts are supervised by the state. The Florida Keys are controlled by the South Florida Water Management District (SFWMD), which has the responsibility to regulate development impacting freshwater wetlands and estuarine systems (FKNMS, 1996. Vol. III of III).

Waste Management Authorities

Florida Solid and Hazardous Waste Management Act

The laws under this Act contain the regulations for the storage, collection, transport, separation, processing, recycling and disposal of waste, including hazardous waste. This Act is promulgated to ensure public health and enhance the environment. According to the waste management authorities, the state is responsible for coordinating solid waste planning including reviews and issues of permits for the construction, operation and closure of solid waste management facilities, creation and enforcement of standards for generation, treatment, storage and disposal of waste and promote recycling. The management of solid waste is required by the Act to have a certain storage, treatment and disposal activities for all types of solid waste, including resident waste and used oil (FKNMS, 1996. Vol. III of III).

Florida State-wide Multipurpose Hazardous Waste Facility Sitting Act

A centralised and co-ordinated permitting process was established by this Act for location, construction, operation, and maintenance of hazardous waste management facilities (FKNMS, 1996. Vol. III of III).

Florida Industrial Sitting Act

In this Act, the industrial sitting regulations provide a centrally co-ordinated permit for review of industrial, commercial, wholesale, or retail projects, to ensure that these projects will protect national resources (FKNMS, 1996. Vol. III of III).

Development and Planning

Local Government Comprehensive Planning and Land Development regulation Act

This act provides local officials the responsibility of planning and regulating the use of land by adopting local government regulations in accordance with the Environmental Land and Water Management Act of 1972 (FKNMS, 1996. Vol. III of III).

State Comprehensive Act

An integrated planning process is created in conformity with this Act in order to guide state policies, specifically land use and water resources. The state comprehensive plan is a long range planning tool to aid in social, economical and physical growth. It provides goals for water resources, coastal and marine resources, air quality, natural systems and recreational lands, waste and land use (FKNMS, 1996. Vol. III of III).

Florida Regional Planning Council Act

This statute set up a formal mechanism for the regional councils and regional plans in order to link local concern, regional policies and state plans (FKNMS, 1996. Vol. III of III).

Miscellaneous

Pesticides

The state gives authority to Florida Co-ordinating council on Mosquito Control to establish and to accomplish its mission (FKNMS, 1996. Vol. III of III).

Waste Water Facilities Regulation

In accordance with this regulation, domestic wastewater plants are used to permit the reuse of reclaimed water and land application of wastewater residuals aspects of wastewater treatment plant. However, the surface water discharges must meet the anti-degradation requirement of the statute (FKNMS, 1996. Vol. III of III).

Underground Injection Well Control

The Country Public Health Units permit to implement septic tanks, or on-site sewage disposal systems (OSDS). The Florida statute (FS) created the Department of Health and Rehabilitative Services in order to conduct the OSDS program. The department is required to provide continuing education courses for septic tank contractors, pump out operators, environmental health specialists, who enforce regulations and master plumbers who install septic tanks (FKNMS, 1996. Vol. III of III).

5.2 Organisational Foundation Needs

The organisational framework needs to be organised in such a way so as to take effective responsibility in managing human activities and adequately protecting the natural resources and environmental quality.

In Florida State, many local governmental agencies, departments and other organisations are responsible for managing individual resources and regulating their use within the marine environment. These agencies provide a system of comprehensive ecosystem management for the long-term protection of diverse natural resources. The limitations in staffing, equipment and funding for enforcement, could result in increasing environmental threats from human activities. The existing agencies are working individually toward preventing and resolving conflicting objectives. Co-operation between multi-agency management program is also needed due to the existing threats to the natural resources.

The state agencies with jurisdiction are:

- The Florida Department of Environmental Protection (FDEP);
- The Florida Marine Fisheries Commission (FMFC);
- The Department of Health and Rehabilitation Service (DHRS);
- The Game and Fresh Water Fish Commission (GFWFC)
- The Department of State (DOS);
- The Department of Commerce (DOC);
- The Department of Agriculture and Consumer Service (DACS).

These agencies are working individually in their field

Florida Department of Environmental Protection (FDEP)

The FDEP was established on July, 1993 as a result of a merger between the Florida Department of Natural Resources and the Florida Department Environmental Regulation.

The Natural Resources Management in the Keys includes Recreation and Parks, Marine Resources, State Lands, Law enforcement, Beaches and Shores, Water Management, Waste management, and Water Facilities are under the responsibility of the division of the FDEP (FKNMS, 1996. Vol. II of III).

Florida Marine Fisheries Commission (FMFC)

The FMFC was created by state legislature in 1983 in order to manage and preserve Florida's renewable marine fisheries resources by ensuring the protection and enhancement of Florida's marine and estuarine environments. To achieve consistent management of the sanctuary resources, the FMFC has to work with Federal Fisheries Management Councils (FKNMS, 1996. Vol. II of III).

Department of Community Affairs (DCA)

The DCA is responsible for planning and regulating land use by approving local government comprehensive plans and land development regulation (FKNMS, 1996. Vol. II of III).

Department of Health and Rehabilitation Services (DHRS)

Public Health is protected by the mission of the Florida DHRS. This agency is taking the responsibility to regulate private water systems, providing mosquito

control, implement beach closures and issue public health warnings regarding contaminated fish (FKNMS, 1996. Vol. II of III).

Florida Game and Water Fish Commission (FGWFC)

The protection of freshwater and upland endangered and threatened species is under the responsibility of the FGWFC (FKNMS, 1996. Vol. II of III).

Department of State (DOS)

The responsibility of the DOS is in respect to the, State, State assisted, Federal, or Federal assisted, activities that have an diverse impact on sanctuary's cultural resources (FKNMS, 1996. Vol. II of III).

Department of Commerce (DOC)

Florida's Department of Commerce (FDOC) is not working on the regulation and also has no own legislative jurisdiction. They however focus on promoting tourism and developing the state's economy (FKNMS, 1996. Vol. II of III).

Department of Agriculture and Consumer Services (DACS)

This agency is responsible for Mosquito Control and Pest Control. It manages the state's mosquito control program (FKNMS, 1996. Vol. II of III).

The overlapping trustee responsibilities of various agencies over resources lead toward achieving the highest possible level of co-operation and co-ordination among these agencies in carrying out the enforcement responsibilities.

5.3 Identification of Key Elements of Action Plans to ensure Sustainable Development

Action Plans are the outline of the process for implementing Management Plans Strategies. It also provides an organised structure. These plans are put together by management strategies sharing common management objectives, and present the initial outline of the steps required for implementation. The Action Plans are created to develop and implement guidelines for policy makers and private sector interests. There are 10 Action Plans in Florida Keys which include:

1. Channel/Reef Marking
2. Education and Outreach
3. Enforcement
4. Monitoring Buoy
5. Regulatory
6. Research and Monitoring
7. Submerged Cultural Resources
8. Volunteer
9. Water Quality
10. Zoning

Each action plan has its own strategy to implement effectively the processes of the management plans.

1. Channel/Reef Marking Action Plan

This Action Plan has strategies for the design and establishment of an effective channel/Reef Marking System for boaters within the sanctuary. The Channel marking is placed in selected areas lacking the navigation aids avoiding resources

damage. The plan provides a standardised system for utilisation throughout the sanctuary. Marking the reef at the entrance and exit areas will minimise the damage done to shallow water resources throughout the sanctuary. In addition, the Action Plan implementation will facilitate enforcement action against damaging effects caused by inappropriate boater activities (FKNMS, 1996. Vol. I of III).

2. Education and Outreach Action Plan

In accordance with the primary mandates of Florida Keys National Marine Sanctuary and Protection Act (FKNMSPA), the public has been educated about the marine environment surrounding the Keys. Educational and outreach strategies in the action plan are divided into two categories: Community involvement/Community program strategies and product development strategies. The first strategy involves an interactive program for the user group such as exhibit production, training programs, workshops, school programs, public-involvement forums and special events. The second strategy relates to the development of specific products including printed materials, audio-visual materials, signs and displays in high use areas of the keys, public service announcements, visitor books and displays etc. The education program has been used as an effective tool since their designation (FKNMS, 1996. Vol. I of III).

3. Enforcement Action Plan

The objective of National Oceanic and Atmospheric Administration's (NOAA) primary law enforcement in the sanctuary is to achieve resources protection by gaining compliance with the sanctuary regulations and other Federal and State statutes that apply within the FKNMSPA and NOAA.

An enforcement is a tool available to manage the marine protection areas. It can be used as a complement to the other programs and lead to increased level of success. Furthermore, it needs to have proper recruitment, training, equipment, policy and guidelines (FKNMS, 1996. Vol. I of III).

4. Mooring Buoy Action Plan

Mooring Buoys are an effective management tool which are used to minimise damage to coral reefs and other sensitive marine resources caused by careless and/or inappropriate anchoring practices. However, the negative impact on marine resources may happen when boats, divers, and fishermen will use mooring buoys inappropriately. This plan will identify an appropriate area for locating mooring buoys and managing activities near coral reefs. Therefore, the negative impacts will be minimised (FKNMS, 1996. Vol. I of III).

5. Regulatory Action Plan

In regards to the regulations of the Florida Keys National Marine Sanctuary, NOAA has the responsibility to enforce the existing regulations under Federal, State and local laws. The co-ordination with existing authorities is very important, for the purpose of administration of the regulations and management strategies for the ecosystem management (FKNMS, 1996. Vol. I of III).

6. Research and Monitoring Action Plan

Research and monitoring are tools to set up a baseline of information on the resource and the various components of the ecosystem. By using the best scientific information, research and monitoring can ensure the effective implementation of management strategies. Such activities must be considered as fundamental processes

and specific management driven topics. Information produced from such activities will be used to provide the public with a means to evaluate the effectiveness of the sanctuary; to provide a means to distinguish between the effect of human activities and natural variability; to develop hypotheses about causal relationships which can be investigated; to evaluate management action and to verify and validate quantitative predictive models used to evaluate and select management actions (FKNMS, 1996. Vol. I of III).

7. Submerged Cultural Resources Action Plan

The natural resources in national marine sanctuaries are needed to be protected and preserved. NOAA is committed to stewardship and trustee responsibilities for the historical resources in the area. The resources can provide benefit and enjoyment to the public so, should be managed and preserved as a historical cultural heritage. Before the permitting of the excavation of historical significant resources, the Federal Archaeological program or equivalent standards of conservation, cataloguing, display, curation, and publication must be assured. NOAA and the state make investment with the public and private partnerships, because the implementation on these projects are expensive (FKNMS, 1996. Vol. I of III).

8. Volunteer Action Plan

Volunteer activities and programs are ways to ensure the success of activities such as boating, recreation fishing, water quality and education strategies in the sanctuary management plan. The volunteer plan can use to support the management activities in sanctuary and help co-ordinate assistance within other sanctuary-related tasks. Moreover, it will help other agencies and groups to work together in solving common management and administration problems. This also provides a method of the

volunteer assistance to the various public and private institutions involved in implementing strategies (FKNMS, 1996. Vol. I of III).

9. Water Quality Action Plan

The water quality Action Plan plays an important role in maintaining resources . The Water Pollution Program focuses on point and non-point sources of pollution because its toxic substances may affect the population of coral, shellfish, fish and wildlife, and recreational activities in or on the water. According to the act, the development of a water quality monitoring program and the provision of opportunities for public participation in all aspects of developing and implementing the program are required. However, the version of information contained within the Water Quality Protection Program Document will be compiled in Action Plan (FKNMS, 1996. Vol. I of III).

10. Zoning Action Plan

Marine Zoning is a management tool to protect sensitive marine resources from overuse and to separate conflict visitor users. The implementation of marine zoning is to assist in the protection of the biological diversity of the marine environment in the area. Marine Zoning can reduce conflicts and lessen the concentrated impact to marine organisms in heavily used reefs by dispersing the users of the natural resources (FKNMS, 1996. Vol. I of III).

Funding

The funds currently available is supported from all sectors, including federal, state, local and private finances, to complete each strategy (FKNMS, 1996. Vol. I of III).

Action Plans are guidelines which provide a good management strategy for an effective implementation and responsibility within a sanctuary in order to protect and prevent the marine resources from exploitation by human activities. Within these strategies are bound the level of existing implementation, personal requirements, existing legislative and regulatory authorities.

The management plan in Florida is a bundle of action plans, structure of organisation and laws/regulations. Each action plan comprises strategies which are based on laws and regulations, which provide for the implementation. However, the existing controlling legal and organisation frameworks in the Florida Keys are effectively implementing the various actions, protecting the marine environment.

Chapter VI

Proposed Organisation for Ensuring Sustainable Development of Sihanoukville and the Necessary Legal Initiatives

The use of coastal areas and its natural resources is needed for national economic development, but it should harmonise with the growth of resources in the area. The development must not endanger the natural systems that support life on the Earth including the atmosphere, the waters, the soils and the living beings.

Cambodia should apply the above to its environmental management structure; lessons learnt from the American structure as indicated in chapter 5, would help to improve the Cambodian mechanism for marine pollution protection.

However, the organisations concerned with environmental issues need to improve on their legal requirements for environmental protection and management so as to promote sustainable development. Bearing this in mind, the organisational and legal framework for coastal management needs to be enhanced, as well as the national policies.

6.1 Responsibilities of Authorities

The authorities should undertake its obligation of measures to protect and prevent the damage to the marine environment.

6.1.1 Improvement of management structure

In order to protect and conserve marine resources effectively, the management structure can be improved by integrated participation and responsibility of the institutions which relate to environmental protection. These agencies should provide a system of comprehensive ecosystem management for long-term protection of the coastal area in Sihanoukville's diverse natural resources.

These agencies with these responsibilities are:

- Ministry of Environment (MOE);
- Ministry of Industry, Mines and Energy (MIME);
- Ministry of Public Works and Transport (MPWT);
- Ministry of Tourism (MOT);
- Ministry of Rural Development (MRD);
- Ministry of Health (MOH);
- Ministry of Defence (MOD);
- Ministry of Agriculture, Fisheries and Forestry (MAFF);
- Ministry of Finance (MOF);
- Ministry of Education, Youth and Sport (MOEYS); and
- Provincial and Local Authorities.

The agencies may consider resources within their mandate to work individually toward preventing or resolving conflicting management objectives. All agencies should increase their capacity to perform effectively. This may not be possible immediately due to limitations in skilled staffs, equipment and funding for enforcement and in order to face the increasing environmental threats from human activities.

This proposal will involve with the responsibility of institutions within the coastal environmental protection.

Ministry of Environment

The Ministry of Environment has a responsibility to protect, preserve and restore air, water and other natural resources. Furthermore, they should protect, the social and economic well-being, and the quality of the citizens. It also plays a leadership role in providing more effective management of natural resources and in protecting the interests of the public, and also in co-ordinating and co-operating among the related agencies.

Ministry of Industry, Mine and Energy

The Ministry of Industry, Mine and Energy is responsible for the management service of minerals such as hydrocarbon and minerals exploration, development and production, which includes formulating and enforcing special lease stipulations, designed to protect specific geological and biological features.

Ministry of Public Works and Transport

The Ministry of Public Works and Transport is also responsible for co-ordinating the prevention of pollution caused by discharged oil from vessels, oil spill accidents, hazardous substances or other pollutants by shipping activities.

Ministry of Tourism

The responsibility of the Ministry of Tourism is to manage beaches and shores, to prevent construction and excavation activities, and also to control tourist activities on the beaches such as diving.

Ministry of Rural Development

The Ministry of Rural Development is responsible for planning and regulating land use which is approved by local development regulations.

Ministry of Health

The responsibility of the Ministry of Health is to protect public health, to provide continuing education in environmental health and to issue public health warnings regarding contamination.

Ministry of Defence

The Ministry of Defence is responsible for patrolling and controlling activities on natural resources along the coastline and co-ordinating and participating in combating pollution which may cause damage to marine life.

Ministry of Agriculture, Fisheries and Forestry

The Ministry of Agriculture, Fisheries and Forestry is responsible for managing fisheries, forestry plans, natural resources in the coastal waters and implementing the protection of marine mammals and endangered species. Its responsibility also

includes the management and utilisation of pesticides and fertilisers for agricultural and other purposes.

Ministry of Finance

The Ministry of Finance is responsible for financing of environmental projects on resources and research.

Ministry of Education, Youth and Sport

The role of Ministry of Education, Youth and Sport (MOEYS) in this case, is to provide knowledge to the new generation on the importance of biological diversity, and how it will be impacted on human activities , and to provide a strategy to manage the environmental resources.

Provincial and Local Authorities

These agencies have a responsibility to maintain water management facilities in the region, and manage solid waste and wastewater from human activities, which may cause pollution to the marine environment.

The proposed management structure to ensure the sustainable use of the marine environment is by achieving a balance between comprehensive resource protection and multiple, compatible use of those resources. However, the agencies should be responsible for these natural resources in conformity with the existing laws.

6.1.2 Improvement of Responsibility and Enforcement

To improve the quality of the environment is to use natural resources within a sustained development. The World Commission on Environment and Development defines environmental development as, 'Development which meets the needs of the present, without compromising the ability of future generations to meet their own needs.' (World Commission on Environmental Development, 1987).

The responsibility should comprise actually management of the marine environment in order to avoid pollution from both solid waste and wastewater. Waste management is under the responsibility of the provincial and local authorities. The provincial and local authorities have decided to set up a landfill program for solid waste.

The landfill should be built on impervious clay, which would minimise leach infiltration. The municipality of Sihanoukville has undertaken to collect waste to dispose at the landfill. At the collection points, containers (facilities) are to be provided for separated waste. This should be left in clearly marked containers at the recycling centre. It is possible to leave everything except, hazardous waste which should be collected in a specially equipped vehicles. This waste is sorted and packed in special containers. Finally it passes it on to subcontractors for treatment. It is important that chemicals must be separated from the ordinary refuse because this can harm both people and nature (SYSAV, 1995).

Domestic wastewater is generated from human activities such as cooking, washing and bathing. It consists mainly of organic matter in solution or suspension and other substances : silt and grit, salts and micro-organisms. All these wastes are biodegradable; they can be assimilated by a receiving body of water. However, the treatment of these wastewaters is necessary.

The system of sewage treatment is needed to ensure, that wastewaters are carried out to the sewage treatment system before discharged into the sea. The industrial wastewater which consists of organic matter, non-biodegradable or hazardous matters include heavy metal or synthetic organic compounds. These are allowed to be discharged into the public sewage treatment works, if they meet the stipulated discharge limits before their discharge into the sewers is permitted. While the industries do not meet the requirement of discharge limits they must carry out their own treatment properly.

An oil refinery is permitted to discharge its effluents into the sea after appropriate treatment and limitation of oil contain permitted should be established in the regulations. The aim of the treatment process is to remove any oil from the water, to produce an effluent in conformity with the discharge standards or to recover the oil for recycling. The discharge of effluent into the sea should not exceed 15 ppm in accordance with MARPOL 73/78 standard for ship discharge, but for discharges in port (static point) usually a more stringent requirement is necessary.

The Port Authority has to provide reception /treatment facilities for ships requiring to discharge their oily waste, in order to reduce or minimise pollution at sea. The standards for discharging limits have been stipulated MARPOL 73/78 in Annex I.

6.2 National Requirements and Policy

The organisational and legal frameworks is a part of the national policy. In accordance with the legislation, action plans are required for implementing management strategies.

6.2.1 Improvement Policy

To achieve the improvement of the national policies of government, the organisational and legal framework should be established for the protection of the marine environment and public health, and the prevention of pollution resulting from human activities. It is important that the policy address the issues on human resources, equipment and funding to support the plan for implementation. Special considerations should be given to capacity-building in order to carry out and enforce regulations effectively, and to increase public and awareness on the impacts of pollution and the public's participation in reporting and supporting the marine environment.

6.2.2 Amendment of National Legislation

The marine environmental protection law was prepared by Ministry of Environment. The establishment of this law is based upon the existing laws of the other relevant regulations. These laws cover only a part of environmental protection which provide no sufficient measures for marine resources management. However, there is need for implementation of relevant international conventions into national legislation. These include MARPOL 73/78, SOLAS 74, London Convention, International Environmental Law and Agenda 21 of Earth Summit. The government of Cambodia has ratified MARPOL and SOLAS conventions on 28/02/1995. The Government should ratify the remaining conventions in order to integrate them into national legislation and regulations and then enforce them.

Technology and economic activities are changing fast. The amendments of technical regulations should be drafted by the technical department of Ministry of Environment and submitted to the ministry for consideration, after which Ministry has to submit it

the government. Approval by the government of these regulations can be enforced as a measure to protect the environment and prevent marine pollution.

These basic laws should be formulated by the relevant ministries, and this would be forwarded to the parliament for approval. When it is approved, enforcement of the law would be carried out by the relevant ministries, for example, the Ministry of Environment.

Currently, Cambodia faces environmental problems both inland and offshore. There has been increased international concern on the health of the oceans, because of the effects of unsustainable human developmental activities. Example of such activities are unregulated dumping of waste by ships, urban waste, other foreign liquids and solids ending up in the marine environment untreated; all of these have a serious effect on the marine environment.

To counter the impact of human unsustainable development on the marine environment, a number of laws on marine protection have emerged. An example is the legislative framework put in place in Florida for the protection of the marine environment.

To achieve effective environmental protection, bearing in mind the lack of legislation on marine coastal management, the author intends to propose the integration of the laws on the protection of Florida's marine environment as mentioned in chapter V into the laws for marine environment in the kingdom of Cambodia.

These laws include the following:

- **Coastal or Resource Management Authority:** Florida Environmental Land and Water Management Act; The Florida Area of Critical State Concern Restoration

Trust Fund Act; Beach and Shore Prevention Act; Coastal Zone Protection Act; Florida Coastal Management Act; Florida Wetlands Protection Act; Florida Communities Trust Act;

- **Water and Air Quality Authority:** Florida Air and Water Pollution Control Act; Florida litter Law; Florida Pollution Spill Prevention and Control Act; Surface Water Improvement Act; Water Resources Restoration and Prevention Act; Water Resources Act;
- **Waste Management Authority:** Florida Solid and Hazardous Waste Management Act; Florida State-wide Multipurpose Hazardous Waste Facility Siting Act; Florida Industrial Siting Act;
- **Development and Planning:** State Comprehensive Act; Florida Regional Planning Council Act;
- **Miscellaneous:** Pesticides; Waste Water Facilities Regulation; Underground Injection Well Control.

For effective enforcement of Environmental Protection and National Resources in Cambodia the following US national laws also need to be considered:

- **Coastal and Sanctuary Resource Management:** Abandoned Shipwreck Act; Coastal Barriers Resources Act; Coastal Zone Management Act; Endangered Species Act; Magnuson Fishery Conservation and Management Act; Marine Mammal Protection Act; Migratory Bird Treaty Act; National Historic Preservation Act;
- **Pollution Control:** Clean Water Act; Clean Air Act; Comprehensive Environmental Response, Compensation and Liability Act; Ocean Dumping Act, Title I of the marine Protection, Resettlement, and Sanctuaries Act; Oil Pollution Act; Port and Waterways Safety Act; River and Harbours Act; Shore Protection Act.
- **Offshore Resources:** Submerged Lands Act; outer Continental Shelf Lands Act;

- **General Nautical Authorities:** Act to Prevent Pollution from Ships; Marine Plastic Research and Control Act;
- **Miscellaneous:** Federal Aviation Act.

It is hoped that the integration of these laws will be useful and effective for marine environmental management in Cambodia. These laws will then be implemented and enforced by the existing resources-related ministries. It will thus result in the natural resources to be used within a sustainable manner.

Chapter VII

CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

Sihanoukville provides enormous opportunity for economic development. The continuous development of service oriented businesses and the rapid exploitation of the natural marine resources will surely have a tremendous effect on the marine environment. Furthermore, the effect on human health was also considered in the study. However, the delicate ecosystem of the Cambodian coast can still be saved through proper and timely action and co-operation between government authorities and all those concerned for the prevention of marine pollution and environmental protection.

This study provides the following conclusions:

- The Cambodian government still lacks the necessary legislative rules and regulations to effect an efficient environmental program.
- There is no clear framework to effect a reliable maritime pollution prevention implementation plan.
- The lack of education and training among the implementing authorities and the general public of the bad effects of marine pollution and improper disposal of waste in the marine ecological system must be properly addressed in the

appropriate government agencies. These should be done by providing the necessary education and training among its personnel and eventual information campaign to the coastal residents of the areas concerned.

- Lack of funding assistance to establish and acquire an effective system and monitoring equipment to implement the provisions of the MARPOL Convention.
- Lack of sustainable development studies were conducted prior to implementation of government maritime related projects.

7.2 Recommendations

The creation of an effective pollution prevention and environmental protection program in Sihanoukville in Cambodia can still be established and implemented. In order to initiate the necessary actions to address the problems identified in the dissertation study the following recommendations are hereby provided:

- Establishment of a clear institutional framework to implement the provisions of the MARPOL Convention in the Cambodian context.
- Incorporation of the relevant provisions of the MARPOL Convention in the Cambodian maritime rules and regulations.
- Continuous education and training of government personnel involved in the implementation of maritime pollution prevention programs. Proper information and dissemination campaign should be conducted to inform all those involved in maritime pollution activities.
- Sustainable development studies must be conducted prior to implementation and construction of projects with possible effects on the marine ecological system.
- Proper co-ordination and co-operation among government agencies involved in the implementation of maritime pollution prevention.

- Encouragement of foreign financial assistance to established an efficient and reliable coastal management system in the development of Sihanoukville, Cambodia.

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