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WORLD MARITIME UNIVERSITY

Malmö, Sweden

**A PROPOSAL FOR PROTECTING THE MARINE
ENVIRONMENT FROM THE EFFECTS OF OIL
POLLUTION IN CAMBODIA**

By

DARARATH YEM

Kingdom of Cambodia

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

MASTER OF SCIENCE

in

MARITIME ADMINISTRATION AND ENVIRONMENTAL PROTECTION

2000

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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DEDICATION

TO MY PARENTS

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ABSTRACT

Title of Dissertation: **A Proposal for Protecting the Marine Environment from the Effects of Oil Pollution in Cambodia**

Degree: **MSc**

The dissertation is a study of the various aspects of oil pollution in the Cambodian marine environment, at both the land-and sea-based pollution.

A brief look is taken at of what Cambodian marine environment consists, related-maritime activities, and trends of oil transport and offshore production in the future. Potential risks and effects resulting from oil pollution to the marine environment, including human health and ecological system are expounded. Socio-economic effects are also identified.

Various national legal instruments and international regulatory systems and legal regimes regarding the prevention and response of the marine environmental pollution by oil in Cambodia are articulated. The requirements of skilled and competent officials and financial assistance, which remain the biggest stumbling-blocks to the development of legislation in Cambodia are discussed.

The role and responsibility of a division dealing with the marine environmental pollution by oil is defined by taking into consideration the development of an effective contingency planning for responding to an oil spill incident. The integration of contingency planning into national response arrangements covering all levels is addressed.

Conclusions and recommendations are made concerning the need for the development of further regulations, rules and standards concerning marine pollution by oil and the compliance and enforcement of those legal instruments, both international and national. Account is also taken into the development and strengthening of institutional and capability of national agencies, the enhancement of co-operation and co-ordination at both national and regional levels.

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LIST OF ABBREVIATIONS

bbf	barrels
BOD	Biological Oxygen Demand
Campex	Cambodia Petroleum Exploration Co., Ltd.
CLC	Civil Liability Convention
CP	Contingency Plan
IMO	International Maritime Organisation
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships
MEPD	Marine Environmental Protection Division
MIME	Ministry of Industry, Mine and Energy
MoE	Ministry of Environment
MPWT	Ministry of Public Work and Transport
NCP	National Contingency Plan
PCD	Pollution Control Department
Premier Oil	Premier Petroleum Cambodia Ltd.
RGC	Royal Government of Cambodia
UNCLOS	The United Nations Convention on the Law of the Sea of 1982
UNDP	United Nations for Development Programme
UNEP	United Nations Environment Programme
WB	World Bank

CHAPTER 1

INTRODUCTION

Marine pollution has become a global environmental concern since the early decades of this century. It arises from anthropogenic activities, including land-and sea-based activities and has substantial impacts within territorial waters. In other words, marine pollution damages the coasts, spoils the beauty and efficiency of ecological systems, impairs the health, economic and social interests of the coastal population and reduces their development perspectives (Fischer, 1998). Pollution by oil has been encountered in the marine environment. It can arise from both land-and sea-based sources and has become of utmost interest to the world public.

This dissertation aims at discussing measures for protecting the marine environment from the effects of oil pollution in Cambodia, as oil pollution will become a major issue to the environment for the nation in the near future. In addition to the introduction part, this dissertation consists of five major parts in chapter 2, 3, 4, 5, and 6 respectively.

Chapter 2 briefly describes the background of the marine environment in Cambodia and activities of maritime transportation within the country. The chapter also describes the pollution resulting from the offshore oil production and from land-based activities and discusses current levels of oil transportation and the trends for the future. Furthermore, the chapter focuses on the analysis of the effects of oil pollution to the coastal and the

marine environment. Such analysis is intended to attract publicity to profoundly understand the whole process of the effects resulting from oil pollution to communities and to actively participate in preventing, protecting and reducing those affects. Economic potential consequences of oil spills into the local environment are also identified in this chapter.

Chapter 3 concentrates on legal frameworks in the context of the development of overall environmental protection legislation and policy. The chapter goes further on explaining provisions related to marine environmental protection, which are provided in the Constitution of the Kingdom of Cambodia and other provisions spelt out within the Law on Environmental Protection and Natural Resource Management. It also points out the role of the organization, namely the Ministry of Environment, which is responsible for the prevention, protection and mitigation of the marine environmental pollution by oil. Moreover, the chapter explains some mechanisms regarding the collaboration between the MoE and other ministries concerned as well as other non-governmental agencies and private agencies. Finally, the last part of this chapter points out the implications of the international marine environmental legislation and other international frameworks to Cambodia.

Chapter 4 discusses the problems arising out of the lack of a specific legislation that the Royal Government of Cambodia or the MoE is facing. The chapter also indicates the implications of the present legal systems and the role of national and local government in the prevention and response of oil pollution. It goes further on identifying the opportunities and threats in the context of legal frameworks related to marine pollution by oil. Lastly, it addresses the advantages of the international compensation scheme for oil pollution to Cambodia. The author has tried to explain the benefits that Cambodia can get when those international conventions have been acceded by it.

Chapter 5 addresses the proposal made by the author to the RGC for the establishment of the response division to deal with marine pollution by oil. The author provides the structure of that division and the way to cooperate with other organizations or institutions involved both public and private. The chapter also points out the mechanisms dealing with oil spill incidents in emergency situations by setting up an effective contingency planning. The integration of the contingency planning into national response arrangements covering all levels, including local, regional, and international plans is also indicated by the author. Finally, the author identifies the requirements of the resources to strengthen the response division to effectively implement the international conventions related to marine pollution by oil and to give effect to those conventions.

The author concludes, in Chapter 6, the dissertation by recommending many mechanisms to improve the current legislation related to marine pollution by oil and strengthen the response organization through building capacity for staff, and cooperating and coordinating within the country and international community.

The author has made efforts in developing this dissertation. The author has also faced many difficulties and challenges in finding information and documentation. Much data and information gathered is out of date. The author has tried to contact and interview resource persons and visiting professors to request available assistance and advice. Furthermore, the author has also conducted research through various pieces of information in the library of World Maritime University and Internet, and asked for other available data and information from other organizations, such as UNEP, UNDP, and WB. Finally, consultation with his supervisor and colleagues is also conducted.

--- * ---

CHAPTER 2

MARINE ENVIRONMENT AND MARITIME ACTIVITY IN CAMBODIA

2.1. Current Marine Environment

Cambodia has a coastline of 435 km, which is located on the Gulf of Thailand and bordered with Thailand and Vietnam. The coastline is shared by three provinces and one city, namely Koh Kong, Kampong Som, Kampot, and Kep City. Kep City has its own authority. The country has 55,600 square kilometers of an exclusive economic zone (EEZ). Even though, the EEZ is small, biological productivity and support diverse habitats are high in the marine waters.

2.1.1. Phytoplankton and Zooplankton

According to the Rudall Blanchard Associates Limited, there are 166 species of phytoplankton and at least 147 species of zooplankton have been found in the inner Gulf of Thailand. Most kinds of them are likely to be located in places which are adjacent to the nutrient enrichment coasts, especially within industrial zones.

2.1.2. Mangroves

The total area covered by mangrove forest in Cambodia has been estimated at 83,600 square hectares (The Ministry of Environment in Cambodia, 1994). Mangroves, which have 74 species, usually grow within the places which endure high rainfall, particularly within estuarine areas, bays of islands, and shelter coasts. Research has shown that most parts of mangroves have been found in the Koh Kong province and the islands, which are located around that province.

Mangrove forests play an important role for reducing wave and wind erosion and serve as a habitat for variety of fauna and flora. Unfortunately, mangrove forests have been clearing for the purposes of firewood collection, charcoal production and development of intensive shrimp farming during the last decade. In an interview with an officer in the Department of Fishery, it was found that approximately 100,000 tons of mangrove trees were harvested in 1992 to produce 24,000 tons of charcoal, part of which was exported to Thailand and Southeast Asian countries.

Therefore, law requirements are needed to be established promptly in order to avoid the mangrove deterioration which is occurring. However, due to lack of legal instruments, the Ministry of Environment has taken measures to cease all illegal logging of the mangrove forests in order to maintain environmental stability within the coastal zone; as a consequence, the result is remarkable.

2.1.3. Seagrass Beds

Seagrass beds have been found in sheltered estuaries which are located between the Vietnamese island of Phu Quoc and the Cambodian Bay in the Kampot province. There are many species of seagrass, including *Enhalus acoroides*, *Cymodocea seradata*,

Syringodium isoetifolium, and Halodule pinipolio (The Ministry of Environment in Cambodia, 1994).

Seagrass beds usually play a vital function in marine ecosystem as the following:

- Providing a good habitat for aquatic life, including fishes, invertebrates, mammals, turtles, and dugongs;
- Making costs stabilized;
- Exporting nutrients to surrounding ecosystems;
- Interacting dynamic physics with coral reefs and mangroves.

2.1.4. Coral Reefs

Coral reefs are of extremely important source, which provides sanctuary-feeding grounds for fishes and other aquatic lives. Generally, the coral reefs support the productivity of the surrounding waters and protect the areas within their confines from high wave energies.

A research conducted by the Ministry of Environment has reported that the coral reefs exist usually around the islands, namely Koh Rong, Koh Rong Sanlem, Koh Thas, Koh Tang, Koh Russey, Koh Takeo, Koh Ses, Koh Pring, and Koh Chhlarm. Of 24 species of coral reefs, 14 species are classified as soft coral and sea fans. The coral reefs, which exist around the Koh Polowai Island, are being damaged, and the reasons for that have not been notified yet.

2.1.5. Marine Fishes

Another research conducted by the Ministry of Environment has also reported that Cambodia has 435 species of marine fishes living within the coastal zone. Those kinds of fishes have been caught about 30,000 tons per year; however, that figure is much higher than the previous year (Department of Fishery, 1996). As being shown in Table 1, the total catch fluctuated from year to year.

Table 1. Total Annual Marine Fishery Harvests, Cambodia, 1980-1995

Year	Total Catch (tons)	Year	Total Catch (tons)
1980	1,200	1988	21,000
1981	814	1989	26,050
1982	3,015	1990	39,900
1983	9,444	1991	36,400
1984	7,721	1992	33,700
1985	11,178	1993	31,100
1986	7,247	1994	30,000
1987	17,417	1995	30,500

Source: Department of Fisheries, 1996.

According to the research conducted by the Union of Soviet Socialist Republics (USSR), marine fishes could be allowed to catch approximately 20,000 tons per year in order to meet the Maximum Sustainable Yield (MSY). Referring to the above table, the annual harvests dramatically increased from 1,200 tons in 1980 to 39,900 tons in 1990, but the catch had declined since 1990. Therefore, the marine fishery industry will collapse and also the reproduction of fishes may become seriously threatened if the Royal

Government of Cambodia will not take any implementation strategy to ensure that the laws prescribed are enforced in order to protect and prevent all illegal fishing by fishermen.

2.2. Maritime Activities

Similar to other coastal states, the Royal Government of Cambodia provides limited varieties of maritime activities. These activities include oil transport, cargo transport, cargo handling, inland transport, towage, and ship repair.

The Kingdom of Cambodia has two international ports, namely the Port of Sihanoukville (PS) and the Port of Phnom Penh (PPP).

2.2.1. The Port of Sihanoukville

The Port of Sihanoukville is situated in the Bay of the Kampong Som province, which is far from the Malacca Strait, about 540 nautical miles. This port was built in 1959 and is estimated at about 950,000 tons per year at present condition. It is a major one among others through out the country, which handles most of bulk cargo, heavy machinery, and all kinds of containers. The port can accommodate ships of 10,000 tons up to 15,000 tons deadweight. The port is also divided into two sectors in which one is for commercial port and the other is for oil port (Ministry of Commerce, 1997-1998, pp. 102-103).

No vessels from any country around the world entered to this port until late December 1988, except those from socialist countries. During the year of 1988, about 118 ships with a total of 207,800 tons of goods were handled by the port. In 1989, the port was entered by most ships from Singapore, Hong Kong, and Japan.

The total number of vessels entering into Sihanoukville port fluctuates gradually from year to year (Table 2). The fluctuation depends on the political situation of the country. For example, the number of ships entering into the port in 1998 decreased extremely in comparison with the figures in 1997 (Table 2). The number is down because of two day fighting in the capital city in early July in 1997.

Table 2. The Movement of Ships and Cargoes in Sihanoukville Port 1991-1998

Year	Ship's Movement	General Cargo (tons)	
		Import	Export
1991	144	45,677	86,873
1992	226	206,642	77,350
1993	337	322,194	152,193
1994	411	439,738	107,575
1995	615	554,278	153,427
1996	686	636,581	104,421
1997	785	652,791	141,485
1998	648	726,048	138,143

Source: Sihanoukville port, 1999.

2.2.2. Phnom Penh Port

PPP is considered as a traditional river port of Cambodia and situated in the Phnom Penh City along the Tonle Sap River. Most vessels from South China Sea through Vietnam enter into this port. The port statistics has shown that 150 ships enter into this port every year.

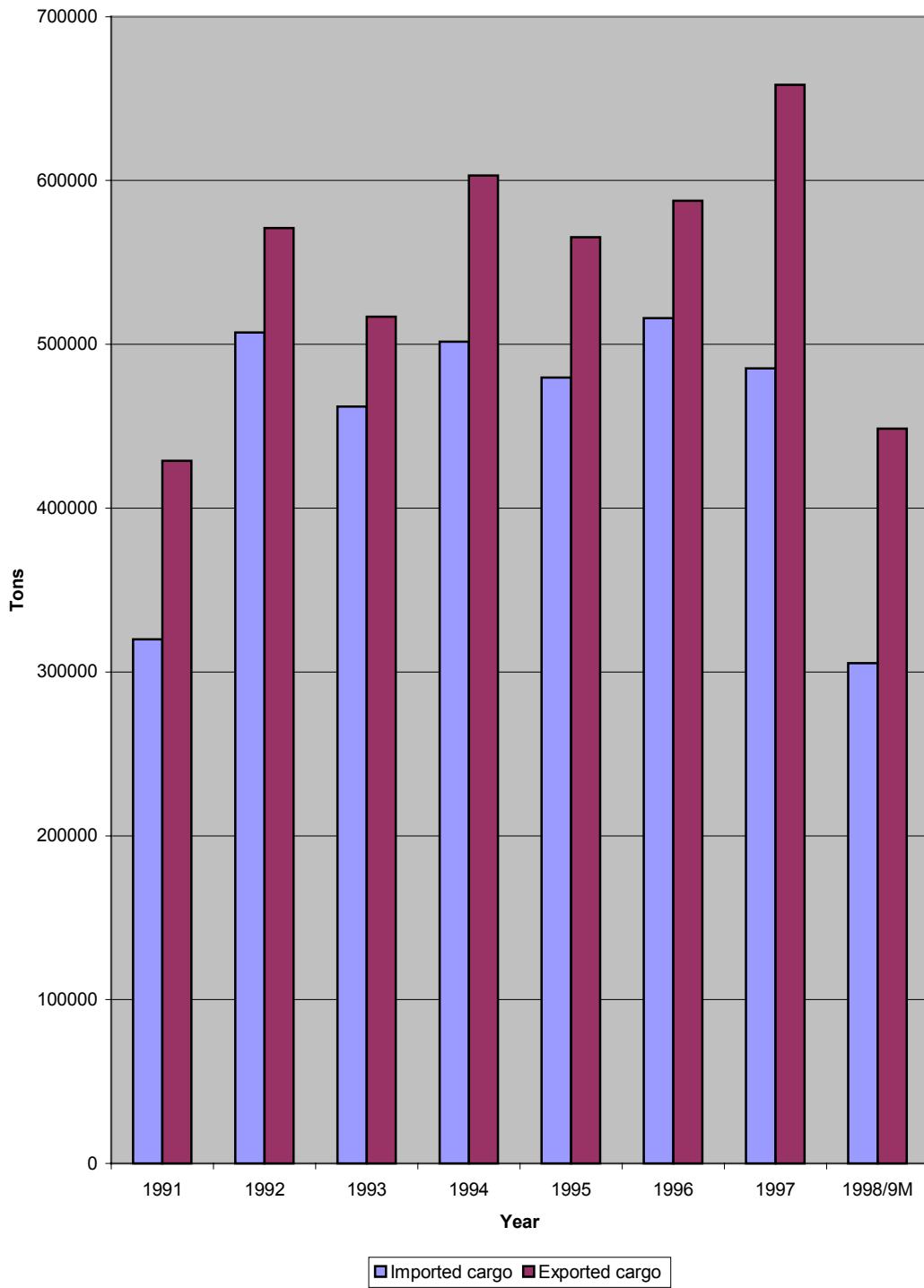


Figure 1. The Movement of Cargo in Phnom Penh Port 1991-1998

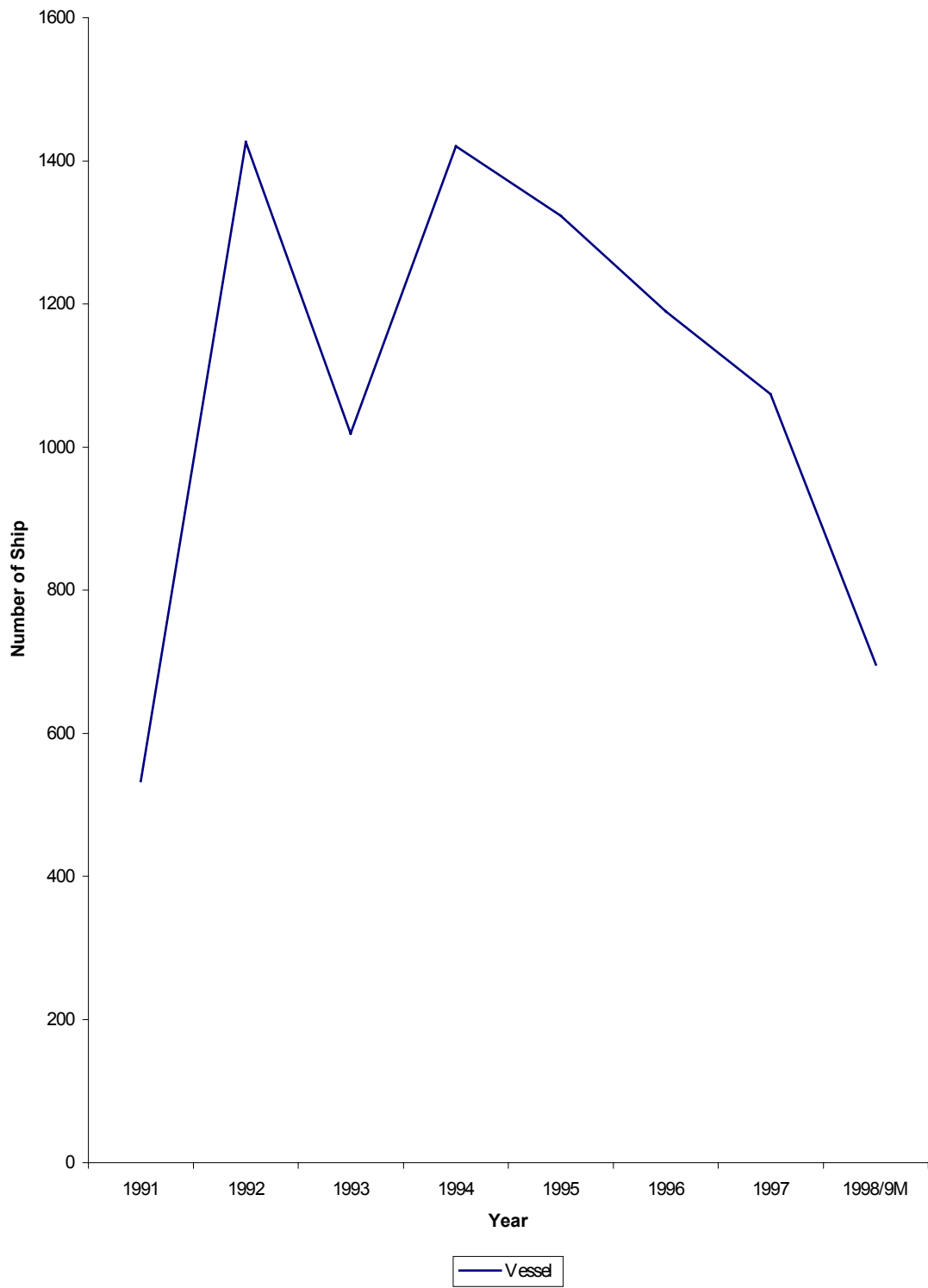


Figure 2. The Movement of Ships in Phnom Penh Port 1991-1998

The route can be accessed, without any difficulty, by vessels of 2,000 dwt and sometime by vessels of 5,000 dwt. The traffic of vessels and cargo via Phnom Penh Port is shown in Figure 1 and Figure 2 above respectively.

2.2.3. Other Ports

Koh Kong Port is small and used for boats of 300 tons or of 500 tons. After customs clearance and formality requirements, all boats may be unloaded or transshipped to other small vessels within this port if necessary.

2.3. Current Levels of Oil Transport and Trends for the Future

2.3.1. Current Levels of Oil Transport

Owing to the oil and gas exploration is being under explored by the three companies, Cambodia presently still imports oil and gas to meet the domestic demand. Approximately 75,000 tons of fuel oil, 126,000 tons of diesel, and 88,000 tons of gasoline were imported in 1993 (The Ministry of Environment, UNDP, and others, 1994).

2.3.2. Offshore Oil Production

A report conducted by the Ministry of Industry, Mines, and Energy in Cambodia has shown that there are three companies, which were offered licenses, involving oil and gas exploration in the offshore blocks in the Gulf of Thailand. Those companies include:

- Enterprise oil: The company was awarded block I & II in 1991 and a test produced a maximum flow rate of 4.7 million cubic feet of gas and 180 barrels of condensate per day. The total depth of the well is about 3,952 m.
- Premier oil: The company drilled a well of 3,867 m in depth in 1994 within block IV and produced a maximum flow rate of 1,180 barrels of oil and 1.3 million cubic feet of gas per day.
- Campex: The company conducted a test between 1993 and 1994 in block III producing a maximum flow rate of 244 barrels of oil and 73,200 cubic feet of gas per day. The total depth of the well is about 3,308 m.

2.4. Oil Pollution from Land-Based Activities

2.4.1. Oil and Gas Refineries and Storage Facilities

Storage facilities, which were established by a joint venture between the State and a French group in 1967, were required to refine imported crude oil with annual capacity of 600,000 tons in Sihanoukville. In 1969, 400,000 tons was expected to be produced by the refinery with an annual export of 120,000 tons of naphtha and fuel oil. A huge amount volume of water is required by the refinery process. Therefore, no doubt, the effluent discharged by the refinery usually contains oil mixtures.

Other storage facilities, which are built by companies, are also located in the coastal zone. These facilities have not been equipped with modern technology yet.

The effluent discharged by the refinery usually contains up to 100 ppm of oil in the water if the refinery is the old one using a steam-cracking process. In the modern

refineries, the water can not come into contact with the oil, and the amount of oil within the water can be reduced to about 25 ppm (Clark, 1992).

2.4.2. Urban and River Run-Off

Garages and vehicle washing places cause a large volume of oil in the water after washing into the drains. That water mixed with oil will finally reach the sea. The total quantity of the oil has been discharged urban and river run-off in Cambodia into the sea is hard to calculate, but the total quantity of petroleum hydrocarbons entering into the sea around the world is estimated about 0.16 million tons per year which is shown in Table 3.

Table 3. Estimated World Input of Petroleum Hydrocarbons to the Sea

Source	Petroleum Hydrocarbons (mt/y)	Total
1. Transportation		
Tanker operations	0.158	
Tanker accidents	0.121	
Bilge and fuel oil	0.252	
Dry docking	0.004	
Non-tanker accidents	0.020	
Subtotal 1		0.555
2. Fixed installations		
Coastal refineries	0.10	
Offshore production	0.05	
Marine terminals	0.03	
Subtotal 2		0.180

3. Other sources

Municipal wastes	0.70	
Industrial wastes	0.20	
Urban run-off	0.12	
River run-off	0.04	
Atmospheric fall-out	0.30	
Ocean dumping	0.02	
Subtotal 3		1.380
Natural inputs		0.250
Total		2.365

Source: Clark, 1992, Marine Pollution, page 29.

2.5. Current Impact of Oil Pollution

2.5.1. The Sources of Oil Pollution

Oil pollution at sea results from many sources as the following:

- Natural sources.
- Maritime activities, including tanker operations, dry docking, marine terminals, bilge oils, and tanker accidents.
- Offshore productions.
- Land-based activities such as municipal waste water, atmospheric deposition, urban and rural run-offs, refinery, storage facility, and ocean dumping.

2.5.2. The Effects of Oil Pollution on the Coast of Cambodia

Cambodia's coastline is located within the Gulf of Thailand which is close to the world's oil shipping lane through Malacca Strait and the refineries and distribution centers of oil in Thailand. Approximately 3.23 million barrels of crude oil are reportedly shipped daily to the East Asian region through the Strait while 3.81 million barrels per day of crude oil and refined products are transported from the region en route to Japan through the South China Sea. There were about 71 shipping accidents occurring during the period of between 1975 and 1993 in which 12 tankers released about 30,000 tons of crude oil into the sea (the Ministry of Environment, 1995). The high risk areas for oil pollution are shown in Figure 3.

According to the statistic of Sihanoukville port, approximately 45,317,000 tons of fuel oil was imported via sea transport into Cambodia for the first three months in 1998. This figure is increasing in comparison with the year of 1997 in which about 146,254,000 tons of fuel oil was transported. Therefore, there was no accident happened during that period; although, some quantity of oil entered into the sea through the operation of the ships, including dry docking, repairs, and cleaning the hull and the transfer of oil from ships to the storage tanks.

In sum, the sources of oil pollution which affect the coast of Cambodia have been found as the following:

- The operations of the ships, for instance, the discharge of oil from machinery spaces into the sea without using filtering equipment or other installations as required by Regulation 16 of Annex I of MARPOL 73/78;

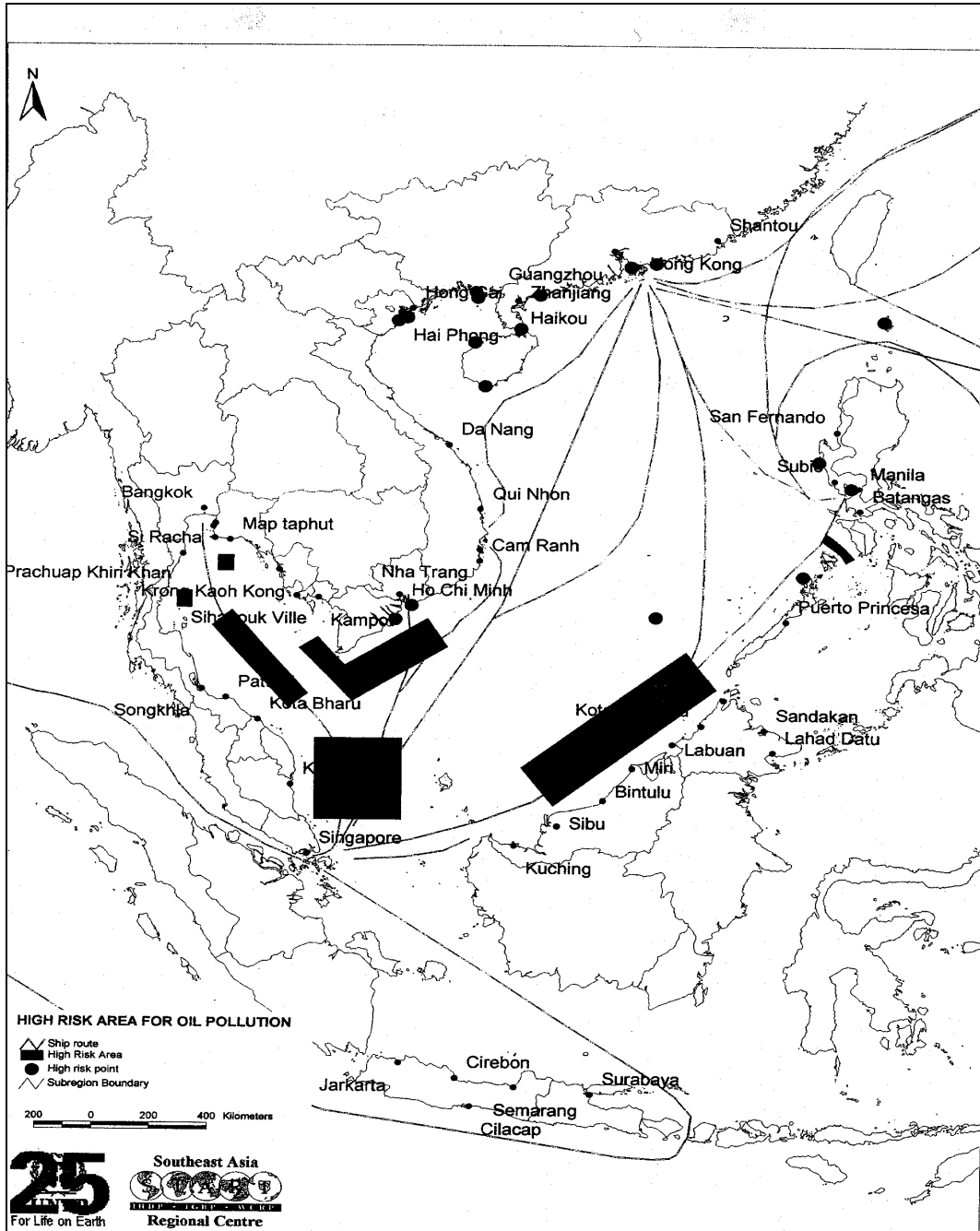


Figure 3. The High Risk Area for Oil Pollution (UNEP, 1997).

- Transshipment of oil;
- Land-based activities, such as oil storage facilities, industrial wastes pertaining to large amounts of oil concentration, urban and river run-off.

However, it is presently noted that no heavy effects to the coast of Cambodia resulted from oil pollution.

2.5.3. The Effects of Oil Pollution on the Marine Environment

Oil, when spilled at sea, can harm aquatic life and human health in different ways and can have very serious economic effects on many areas, including the tourist industry on beaches of a coastal state and the marine environment. Crude oil, complex mixtures of hydrocarbons of varying molecular weight and structure, which consist of chemical substances, such as paraffinic, naphthenic, and aromatic, is mostly transported around the oceans in the world.

The estimate of the total volume of crude oil transported around the world is about one and half billion tons a year (Clark, 1992). During the transport, crude oil has been always entered into the sea through shipping accidents and shipping operations. Furthermore, crude oil can be released into the sea through the blow-out of offshore production.

2.5.3.1. The Fate of Oil Spills in the Marine Environment

When the oil spilled into the sea, it spreads over the surface of the water as a thin layer and then forms a slick because its density is much less than the density of the water. It means that oil does not dissolve in water. The rate of spreading depends on the amount,

and the type of oil spilled, for instance, persistent or non-persistent oil, and the weather conditions within the place where it spilled.

It has been noted that there is a distinction between persistent oil and non-persistent oil when spilled at sea. Persistent oil is likely to dissipate more slowly in the water and requires a clean up response as soon as possible, while non-persistent oil disappears quickly from the sea surface.

According to the ITOPF, the characteristics of oil spilled at sea depend upon the physical properties, including specific gravity, distillation, viscosity, and pour point. The density of crude oils and petroleum products is calculated as the following formula:

$$^{\circ}\text{API} = (141.5 / \text{Specific Gravity}) - 131.5$$

The characteristics of distillation, viscosity, and pour point rest upon the temperature. For example, the decrease of the viscosity of oil at higher temperature can make oil flow very easily in the water.

It has been shown that various processes, including weathering, spreading, evaporation, dispersion, emulsification, and combined processes can occur when oil spills at sea.

2.5.3.1.1. Weathering Process

The weathering process will change the characteristics and the behavior of oil in the sea water. The understanding of these processes are valuable for people who are involved in preparing contingency planning for the response to oil spills.

2.5.3.1.2. Spreading Process

Oil slicks on the sea surface will spread rapidly within a period of the early stages of a spill (Figure 4). The main factor, among others, affecting spreading is the volume of the oil spilled. A large instantaneous spill will spread more rapidly than a slow discharge. As has been previously shown the viscous oil rests upon the temperature. High viscosity oil as a result of low temperature will spread slowly in the water.

According to the Manual on Oil Pollution by IMO, after few hours the slick begins to break up and form narrow bands which are called “windrows” parallel to the wind direction. Also, spreading depends upon such factors as currents, tidal streams and wind speeds. For instance, oil can be spread within an area of up to five square kilometers after 12 hours of a spill (Pardo, 1999).

2.5.3.1.3. Evaporation Process

The physical characteristics of crude oil spilled at sea have been changed during this process, especially in the early stages. The evaporation process is affected by many factors, including rough sea, high wind speed, and warm temperature. For example, the rate of evaporation will increase in the case of high temperature.

The evaporation is also dependent on the types of oil. Oil products from refineries may evaporate completely within a few hours during the early stages of a spill, while heavy crude oil and fuel oil may be a little bit slow.

2.5.3.1.4. Emulsification Process

This process is caused by the formation of water-in-oil emulsions, which remains in the persistence of light and medium crude oils on the surface of the sea. However, emulsions may break out into oil and water again if the water becomes calm and heated by sunlight.

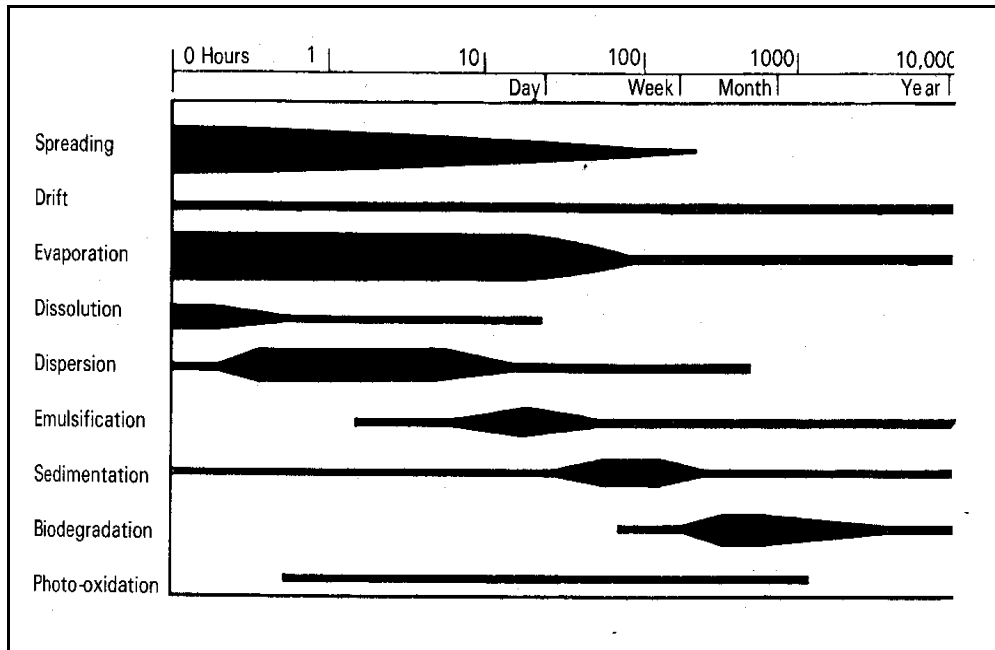


Figure 4. Time Span and Relative Importance of Processes Acting on an Oil Spill.
Line length: Probable time span of any process. Line width: Relative magnitude of the process both through time and in relation to other contemporary processes (IMO, 1988).

2.5.3.1.5. Biodegradation Process

Some microorganisms are in need of oil as a source of carbon and energy. The temperature and the availability of oxygen and nutrients are major factors affecting the rate of the biodegradation process. Therefore, if oil becomes incorporated into sediments, the rate of the biodegradation will be much reduced because of the shortage of oxygen and nutrients in that area.

The processes of spreading, evaporation, dispersion, emulsification, and dissolution are considered as the main ones during the early stages of an oil spill at sea. Besides these processes, there are still some processes such as oxidation, sedimentation, and biodegradation which occur after a few days of a spill.

2.5.3.2. The Effects of Oil on the Marine Environment

It is difficult to give a precise estimate of the effects of a particular oil spill because the effects may depend upon such factors as the amount of oil spilled, the oil characteristics, the type of oil, and the local conditions at the time of the spill. By conducting research, the author has found the effects of oil spilled on the marine environment as the following:

2.5.3.2.1. Ecological Effects

According to the Manual on Oil Pollution published by the IMO, ecological effects are considered the effects which result from a spill related to physical and chemical changes in habitats, in growth, physiology and behavior of individual organisms and species. The spills also lead individual organisms and species to die. However, the effects on

marine life are based upon the nature and the age of the oil spilled; considerable varieties of animals and algae are killed.

It has been indicated that seabirds and mammals are contaminated by floating oil on the surface of the sea. The oil can harm seabirds and mammals by coating their feathers and fur which make them difficult to move from one side to another. For instance, the spill of 35, 000 tones of crude oil following the grounding of the Exxon Valdez in Alaska in March 1989 resulted in over 30,000 known seabird deaths and probably very many more, (Clark, 1992).

Dispersed oil or water-in-oil emulsion floating on the surface of the sea water can have an impact on the fishing activities within the areas which are affected. Therefore, the consequences of an oil spill will cause a very serious damage to the marine lives even in an incident spilling a small amount of oil.

2.5.3.2.2. Biological Effects

Numerous studies have been conducted to learn more about the biological effects of oil on marine organisms and shown that the components of the oil in the sea water can interfere with sex behavior of marine animals and affect on chemical orientation of the marine environment (Gerlach, 1981).

Most importantly, oil can increase biological oxygen demand (BOD) and interfere with natural processes such as reaeration and photosynthesis which enormously affect on food supply of plants and wildlife, particularly fish.

2.5.3.2.3. Economic Effects

The economic effects of oil spills on human activities such as recreation, industry, and fishery can be considerable (Dicks & White, 1995). When oil spills on beach, it adversely affects the business of hotels and restaurants by interfering with bathing and boating. Furthermore, most industries, which need seawater as their resources, have to shut down because of oil effects; otherwise, these effects will lead to internal damage and other facilities.

It has been found that oil spilled at sea does not extremely harm fishes within a large volume of water because a great deal of fishes is able to swim away from the polluted areas which are affected by oil. However, spilled oil may have indirect short term economic effects on fishing by, for instance, the reluctance of consumers to buy the products from the areas which are affected by the oil.

In an environmental point of view, the fishing products from the areas affected by oil may produce harm to people who have eaten the fish. For example, as being indicated by Cormack, polyaromatic hydrocarbons presented in oil pollution might concentrate in the tissues of the marine organisms and which induce cancer in man by consuming those organisms as a food. As long as the oil slick remains on the surface of the sea water, it may cause serious threats to fishing operations because both fishing gear and catch are likely to be contaminated by the oil.

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CHAPTER 3

MARINE ENVIRONMENTAL PROTECTION LEGAL FRAMEWORKS

The issue of marine environmental pollution was considered as a global agenda in the late twentieth century. It became not only a high priority, among other things, of a government's concern of any state, but it was also a major concern of inter-governments as well as other organizations around the world.

One of the most important keys of effective measure is to formulate and develop a national policy toward the prevention and protection of marine pollution from various sources. The government has to have a clear objective and mission to deal with marine environmental pollution.

Another most important key of effective and sufficient environmental protection is to provide a comprehensive and a specific legal framework for the specific area within the local circumstances. It means that specific marine pollution cases need specific legislation to tackle a particular problem. General legislation in these specific cases might not apply.

The other one is to take into account other international legal instruments before establishing any other local or national legislation which is aiming at dealing with the

prevention, protection, and mitigation of the marine environmental pollution from various sources, particularly from a maritime aspect.

3.1. National Environmental Policy

3.1.1. The Constitution's Policy towards Environmental Protection

After free and fair election in 1993, a new constitution and government were established. The Royal Government of Cambodia (RGC) takes into account the environmental concerns in its national policy in order to protect public health and conserve natural resources from being destroyed. As stated in the Article 59 of the Constitution of the Kingdom of Cambodia which was adopted in 1993:

The State shall protect the environment and balance of abundant natural resources and establish a precise plan of management of land, water, air, wind, geology, ecological system, mines, energy, petrol and gas, rocks and sand, gems, forests and forest products, wildlife, fish and aquatic resources.

To be effective, the RGC established the Ministry of Environment to be responsible for the prevention and protection of the environment from being polluted by human activities and conservation of the natural resources. Legal systems and a national management plan were also set up in order to suppress any unlawful act which intends to destroy the quality of life for humankind and to pollute the atmospheric environment.

Royal Decree on Creation and Designation of Protected Areas was adopted in 1993 by the King. The Decree assigned authority to the Ministry of Environment (MoE) to set up the management planning in order to preserve the protected areas as national parks for recreation from extinction.

3.1.2. The Policy of the Ministry of Environment

To effectively and sufficiently implement the national policy which was adopted by the National Parliament, the MoE was established in 1993 (Figure 5). The major objective of the MoE is to supervise and manage the environment throughout the Kingdom of Cambodia. The MoE has been assigned to develop the environmental policies and put them in place for being implemented in order to ensure that the sustainable development of the country has successfully been achieved.

Besides developing environmental policies, the MoE has developed environmental legislation and specific regulations to deal with all aspects regarding environmental pollution which may affect the ecosystem and public interests. For example, it has prepared many proposals for national and regional environmental action plans in collaboration with other ministries concerned.

It has been understood that to effectively and sufficiently control and inspect any unlawful act related to environmental pollution, it is important that making inventory on the sources, types, and quantities of all solid, semi-solid, and liquid wastes, pollutants, toxic and hazardous substances, noise and vibration, and emissions be conducted by the MoE in collaboration with the ministries concerned. During the inspection period, reporting to the competent authorities is also needed in order to avoid reoccurrence of pollution accidents.

Another important point is that the MoE has cooperated with national and international organizations, non-government organizations, local communities, and other countries in doing its work in order to promote environmental protection throughout the Kingdom of Cambodia.

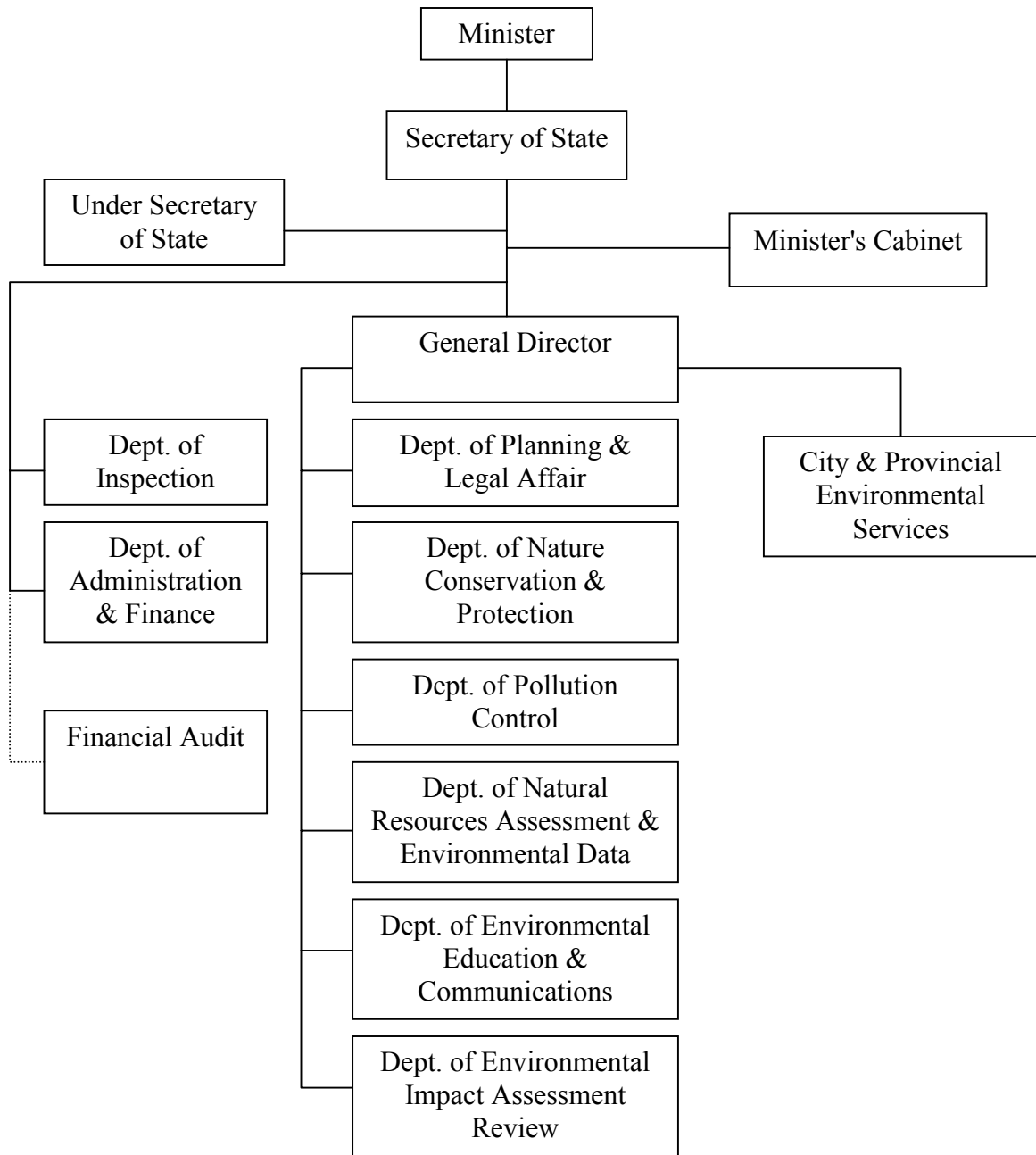


Figure 5. The Structure of the Ministry of Environment (The Ministry of Environment, 1998).

3.2. National Environmental Protection Law

3.2.1. Law on Environmental Protection and Natural Resource Management

As mentioned above, it is essential that the legislation for the prevention and protection of the environment must be established in order to suppress any other unlawful act which already existed, is existing or will exist, and which is about to be detrimental to the quality of life for humankind and ecological systems within the air, land, and water.

Having seen that protecting the environment is a high priority among others, the Law on Environmental Protection and Natural Resource Management was adopted by the National Assembly of the Kingdom of Cambodia on November 18, 1996, during the 7th session of the first legislature. The main objectives of this law are aiming at:

- Protecting and upgrading the environment quality and public health by means of prevention, reduction and control of pollution;
- Making assessment on any impact to the environment, before issuance of decision by the royal government on all submitted proposed projects;
- Ensuring the rational and sustainable preservation, development, management and the use of the natural resources of the Kingdom of Cambodia;
- Encouraging and providing possibility for the public to participate in the prevention and protection of the environment and the management of the natural resources; and

- Suppressing any act which may affect the environment.

The Law on Environmental Protection and Natural Resource Management consists of eleven chapters as the following:

- Chapter I: General provision.
- Chapter II: National and regional environmental plans.
- Chapter III: Environmental impact assessment.
- Chapter IV: Natural resources management.
- Chapter V: Environmental protection.
- Chapter VI: Monitoring, record keeping, and inspection.
- Chapter VII: Public participation and access to information.
- Chapter VIII: Environment endowment fund.
- Chapter IX: Penalties.
- Chapter X: Transitional provisions.
- Chapter XI: Final provisions.

The law has also given the power to the MoE to take an action to prosecute a person who commits any illegal activity which causes damage to the public health or human life or to the environment by bringing a suit to the national court. The punishment has a period of one year up to five years in prison.

3.2.2. Sub-decree on Solid Waste Management

To be effective and sufficient, the MoE has given the authority to the Department of Pollution Control (DPC) to take measures to prevent, protect, and reduce the pollution which may affect the environment (Figure 5). The DPC is, in accordance with the sub-decree on the organization and functions of the MoE, assigned tasks as the following:

- Assisting the Royal Government meet its responsibilities under international agreements, conventions and protocols pertaining to environmental quality protection;
- Developing an inventory of the sources, types, and quantities of all solid and liquid wastes, pollutants, toxic and hazardous substances, emissions, noise and vibration in collaboration with the ministries concerned;
- Developing and implementing sub-decrees and other legal instruments for protecting the quality of the environment and for controlling pollution throughout the Kingdom;
- Monitoring and reporting on the status of the environmental quality including, air, water, soil and noise pollution to the general public;

- Proposing procedures for inspecting pollution sources and reporting on offences to the competent authorities in collaboration with the ministries concerned; and
- Enforcing the law as prescribed by Chapter 9 of the Law on Environmental Protection and Natural Resource Management.

Solid waste and toxic substance management is a high priority among others within the DPC. Having seen that the pollution caused by solid waste and hazardous substance is affecting the environment, a sub-decree on Solid Waste Management was adopted by the Council for Ministers in 1999. The objectives of the sub-decree are aiming at:

- Providing, on the one hand, comprehensive information on production of wastes for the basic rules and legal framework necessary to manage all types of solid wastes in a way to ensure that the integrity and quality of the environment and natural resources are not harmed, and public health and safety are not endangered; and
- Implementing and enforcing, on the other hand, the Law on Environmental Protection and Natural Resource Management of 1996.

3.2.3. Sub-decree on Water Pollution Control

The MoE is empowered to establish a specific regulation or sub-decree on water pollution control aiming at preventing and mitigating water pollution of public water areas in order to maintain the water quality and to protect bio-diversity from being polluted by human activities.

The sub-decree also specifies provisions regarding the standards for the effluent discharge from any sources of pollution. Inspection procedures are conducted by an officer of the MoE in collaboration with the ministries concerned. Similarly, the penalty and punishment within the sub-decree are taken in accordance with the Law on Environmental Protection and Natural Resource Management.

3.2.4. Relevant Provisions in other Laws and Regulations Involved

As the environmental pollution issues are presently a high priority in the Royal Government of Cambodia, many other laws and regulations are required to be taking into account provisions related to the environmental protection and prevention within them. Those provisions must be provided in accordance with the articles stipulated in the Law on Environmental Protection and Natural Resource Management; otherwise, it might be confusing in practice.

3.3. The implications of the United Nations Convention on the Law of the Sea of 1982 (UNCLOS) to Cambodia

Cambodia signed UNCLOS in 1994. The UNCLOS is an international law which provides international regime spelt out within Part XII for dealing with the protection and preservation of the marine environment. Under this Convention, Cambodia has the right to adopt national laws and regulations to prevent, reduce, and control pollution of the marine environment caused by casualties of maritime incidents or activities.

It is therefore required that Cambodia should establish its own national legislation for dealing with environmental pollution aspects in order to give effect to the UNCLOS. This means that when Cambodia became a party to the UNCLOS Convention, it was obliged to implement that Convention by incorporating it into the national legislation.

Even though, Cambodia does not have a specific legislation regarding marine environmental law protection, some provisions dealing with this matter are stipulated, for instance, in the Constitution of the Kingdom of Cambodia and the Law on Environmental Protection and Natural Resource Management, the Fishery Law, and other laws and regulations.

The Article 58 of the Constitution of the Kingdom of Cambodia provides that the sea, continental shelf, coastline, and natural resources are a State property. The control, use, and management of that property shall be determined by law. This means that the Kingdom of Cambodia has sovereign rights over its territorial sea and natural resources. The State can, under its Constitution Law, take any measure to prevent and protect any unlawful act which might affect the marine environment of the Kingdom of Cambodia.

Furthermore, as a coastal State, Cambodia is required by the international regime which is spelt out within UNCLOS to cooperate on a global and regional basis in establishing rules and standards to prevent, reduce, and control pollution damage in its territory. Also, Cambodia is urged to take all measures necessary to ensure that activities under its jurisdiction are conducted as not to damage other coastal States and their environments. This means that pollution damage arising from incidents or activities under Cambodia's jurisdiction will not spread beyond the areas where Cambodia exercises sovereign rights in accordance with UNCLOS, which it has ratified.

3.4. International Marine Environmental Legislation and Other International Frameworks

Cambodia had not joined the International Maritime Organization (IMO) for more than two decades since 1970 because of political conflicts within the country. But, after the

political situation has been stabilized, the government rejoined that organization in 1994. As a result, most conventions developed by the IMO have not been ratified and updated by the Royal Government of Cambodia yet.

3.4.1. International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)

It has been noted that MARPOL 73/78, which was adopted by the IMO to replace the International Convention for the Prevention of Pollution of the Sea by Oil of 1954 and 1969, is considered as a comprehensive instrument for dealing with all aspects of marine pollution from ships. This Convention applies to any ship of any type and size. Neither land-based pollution nor pollution arising from exploitation and exploration is covered by the Convention. By understanding that MARPOL 73/78 is a very comprehensive Convention, Cambodia needed to ratify it in 1994.

The Convention has given effect to Cambodia as a flag State, under its national law, to punish any violation of the Convention. This means that if there is any violation of the Convention occurring within the jurisdiction of Cambodia, which is a Party to the Convention, the punishment will be fallen under Cambodian national law.

As required by the Cambodian Ship Registry, an authorized surveyor has the right to conduct survey and certification in order to ensure that ships flying its flag are constructed, equipped, and maintained in accordance with standards which were laid down in the Convention. Alternatively, the registry also recognizes the surveys conducted by such classification societies as ABS, BV, DNV, GL, KRS, LR, NKK and any other class as authorized by the Cambodian Ship Registry. As provided by MARPOL 73/78, the survey has the following stages:

- Initial survey which is conducted before the issue of the certificate for the first time;
- Periodical survey which is conducted within the period of not exceeding five years;
- Intermediate survey which is conducted at least once within periodical survey; and
- Annual survey.

The Convention covers technical matters of pollution from ships which are laid down in five annexes as the following:

- Annex I: Pollution by oil;
- Annex II: Pollution by noxious liquid substances carried in bulk;
- Annex III: Pollution by harmful substances carried in packages, portable tanks, freight containers;
- Annex IV: Pollution by sewage from ships;
- Annex V: Pollution by garbage from ships; and
- Annex VI: Regulations for the prevention of air pollution from ships and Nox technical code.

For the country which has ratified the convention, Annex I and II are mandatory while the rests are optional. The Convention will be probably expanded to other Annexes which deal with ballast water and anti-fouling paints.

3.4.2. International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution, 1969 (Intervention Convention)

The Intervention Convention was adopted by the IMO in 1969 which aimed at enabling countries to take action on the high seas in cases of a maritime casualty resulting in danger of oil pollution of the sea and coastlines and ensure that such action taken would not affect the principle of freedom of the high seas.

The Convention also allows the Parties to the Convention to take such measures on the high seas that may be necessary to prevent and mitigate a grave or an imminent danger to their coastlines or related interests from pollution threat by oil. The Convention applies to all sea-going vessels except warships and other vessels owned by a State and used for government non-commercial purposes.

Under the Convention, the coastal State is empowered to take only such action as is necessary after due consultations with appropriate interests, including the flag State, the owner of the ship or cargo involved and independent experts. If the coastal State takes such action beyond those permits under the Convention, it is liable to pay compensation for any damage caused by such measures.

3.4.3. International Convention on Civil Liability for Oil Pollution Damage, 1969 & 1992 (CLC 69 & 92 Convention)

The 1969 CLC Convention applies to ships which are actually carrying oil in bulk as cargo. The main objective of the Convention is to pay compensation to those suffering oil pollution damage in a State party to the Convention. However, spills from tankers during ballast voyages and spills of bunker oil from ships other than tankers are not covered by the 1969 Convention.

Unlike the 1969 Convention, the 1992 Convention is expanded to cover damage suffered in the territory, territorial sea or exclusive economic zone (EEZ) or equivalent area of a State party to the Convention. However, the compensation is restricted; the costs incurred or to be incurred for reasonable measures to reinstate the contaminated environment are covered by the Convention.

Under the 1992 Convention, the owner of the tanker has strict liability and is exempt from his liability only if he proves that the damage resulted from an act of war or a grave natural disaster; or the damage was entirely caused by sabotage by a third party; or the damage was entirely caused by the negligence of public authorities in maintaining lights or other navigational aids.

The shipowner is entitled to limit his liability under the Convention, but if it is proved that the pollution damage resulted from the shipowner's personal act or omission, committed with the intent to cause such damage, or recklessly and with knowledge that such damage would probably result, the shipowner is deprived of the right to limit his liability.

3.4.4. International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971 & 1992 (Fund 71 & 92 Convention)

The 1971 and 1992 Fund Conventions were established to pay compensation to those suffering oil damage in a State party to the Conventions who does not obtain full compensation under the 1969 and 1992 CLC Conventions respectively.

The 1992 Fund Convention does not pay compensation if the pollution damage occurred in a State which is not party to the Convention; or the pollution damage resulted from an act of war or caused by a spill from warships.

Although the Convention has been established, Cambodia has not ratified it yet.

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CHAPTER 4

ANALYSIS OF THE PROBLEMS FACING IN CAMBODIA

4.1. Implications of the Present Legal Systems

As indicated in the previous Chapter, the Constitution is a supreme law of the Kingdom of Cambodia. All legal instruments must be submitted to the National Assembly for approval in order to give effect to them. For example, the Law on Environmental Protection and Natural Resource Management was adopted by the National Assembly in 1996 and entered into force in Phnom Penh 10 days later, and 20 days later throughout the rest of the country. The different period for entering into force is prescribed by the Article 93 of the Constitution of the Kingdom of Cambodia. However, in emergency situations any law can take effect immediately throughout the country after having been adopted by the National Assembly.

According to the Article 59 of the Constitution of the Kingdom of Cambodia and Article 13 of the Environmental Law, the MoE is given the right to establish other regulations, as it deems necessary. The prevention, reduction and control of the environmental pollution, especially marine pollution by oil is, under Environmental Law, the responsibility of the MoE. This means that the MoE is empowered to set up rules and

standards in accordance with the international conventions and obliged to implement and enforce them effectively at the national level.

One of the most frequent problems that has been encountered is that, according to the overlap in jurisdiction among institutions concerned, the MoE is required by the law to collaborate and consult with those ministries in developing standards or guidance for the prevention and minimization of the adverse effects to the marine environment and committing its tasks. The idea of the collaboration may go further. Monitoring and inspection activities, which are done by the MoE officials, are also required by the law to collaborate with other ministries. This shared power may lead to the MoE facing many difficulties in doing its job in case of an emergency situation. For instance, in case of finding the source of pollution on the beach during a period of patrol by an officer of the MoE, question will raise whether the officer has to consult or collaborate with the ministries concerned to prosecute the person who is breaching the law or not.

Another problem that has been found is that delegation of the authority and responsibility to the provincial and local authorities to carry out their jobs on behalf of the MoE is not allowed. Therefore, if a spill occurs within the coast of any province, the local authority of that province must report to the ministry and wait for a decision, as it has no power or authority to take action. This may influence the extent of property loss, environmental damage, diminished public and political goodwill, and loss of livelihood, health, and perhaps lives.

The other problem is that the accountability of the appliance and enforcement of the international conventions after having been ratified are not clearly assigned. For example, the implementation of MARPOL 73/78 Convention is the responsibility of the port authority in Sihanoukville; neither the MoE nor the Ministry of Public Works and Transport. According to the provision provided by the Constitution and the

Environmental Protection Law, it can be construed that the MoE is responsible for the control of the compliance and enforcement of MARPOL 73/78 within not only the territorial waters but also the port area as well as onboard a ship. The lack of clear accountability and authority may pose a serious difficulty to each institution in taking its action within its scope of work concerned with the prevention and reduction of the pollution by oil both from land-based and ship sources.

Furthermore, when a State, by and large, becomes party to an international convention by the process of ratification or accession, the legal effect of it is that the State then becomes bound by the convention and is therefore obliged to implement it by incorporating it into its body of national law (Mukherjee, 1999). It means that some form of approval by the legislative body of the State is required. Unlikely, even though the ratification of the international conventions or treaties is, under the Article 26 of the Constitution Law, required to be undertaken by the National Assembly and the Senate which are the legislative body of the Kingdom of Cambodia, this task is often taken by the RGC even the power is not delegated to it. As a consequence, the implementation of those conventions is very weak as they are not announced by the National Assembly and the Senate to the public throughout the country.

In conclusion, the relationship between Parliament (National Assembly and the Senate) and the Government concerning legislation is complex and not well defined. The lack of clear definitions may lead to the executive body facing many problems during its mandate.

4.2. The Role of National and Local Government of Cambodia in the Prevention and Response of oil Pollution

4.2.1. Prevention of Oil Pollution

Owing to the enormous growth in the maritime transport of oil, and the size of tankers, being carried by sea, and a growing global concern for environmental issues made many feel that effective and sufficient international regimes such as MARPOL 73/78 are required to establish and put immediately in place within jurisdictions of coastal States in the world. To be effective, the Coastal States are obliged to put these kinds of regimes into their national law after the process of ratification or accession.

As a coastal State, Cambodia has been making efforts to develop and formulate regulations and standards in accordance with the international rules and standards to cope with the prevention and mitigation of marine pollution by oil.

4.2.1.1. Legislative

To effectively address marine pollution by oil in Cambodia, appropriate legislation and regulations are needed to be established. As mentioned in Chapter 3, although a number of legislations related to marine pollution have been established, Cambodia is still facing lack of numerous laws, regulations, and standards in respect of the prevention and reduction of marine pollution by oil. The lack of those matters will lead to damage to the marine environment such as destruction of mangroves and coral reef ecosystems in the near future through, for instance, the release of waste water containing oil components from industrial activities, the discharge into the sea of oil or oily mixtures from ships, and oil spill incidents.

Even though, environmental issue is a high priority among others, the legal regimes covering coastal and marine issues still remain fragmented and are not incorporated into other appropriate legal instruments. Thus, delegation of responsibilities to subordinates to act on RGC's behalf in the prevention and reduction of marine pollution by oil, especially in preparation for and response to oil pollution incidents is not effective and sufficient whenever rudimentary regimes exist. For example, if a major oil spill incident occurs within the coast of Cambodia, no doubt no competent authority will immediately take actions to respond to that incident as accountability and authority for taking those actions are not clearly laid down in the existing legal instruments.

Furthermore, it is plain that updating international and national legislation dealing with marine pollution by oil is very essential for the protection of the marine environment. For instance, it is suggested that the RGC might wish to accede to the 1992 Protocols to the Civil Liability Convention and the Fund Convention, not to the 1969 and 1971 Conventions.

Therefore, the reason why effective and sufficient legal regimes are necessary is the fact that marine pollution by oil spill incidents on the coast of Cambodia will affect the interests not only of the state occurring the spill but also of the other countries who utilize those waters for other purposes, such as fishing or recreation. In fact, the RGC has to continue making its efforts to integrate other international regulations, rules and standards into the national law and gives effect to them by announcing those regulations, rules and standards to the public for effective application throughout the country.

4.2.1.2. Policy

A major role of the national government is to formulate and develop policies towards a particular aspect regarding the prevention and mitigation of marine pollution by oil in a

particular geographical area. Although, the environmental management approach in Cambodia was initiated in 1993, a policy covering oil pollution is still lacking.

It is essential that the RGC should establish immediately a policy of the marine pollution by oil in order to protect public interests and public health that have been suffering damage as a result of the pollution. Furthermore, the policy should prescribe a way that local authorities have enough right and authority to take on a primary role in the prevention and reduction of oil pollution affecting the coast.

4.2.1.3. Implementation and Enforcement

Even though, the Royal Government of Cambodia has ratified numerous international conventions dealing with marine pollution, particularly with marine pollution by oil, it does not mean that RGC has implemented and enforced those conventions because the international conventions rarely provide for an effective implementation and enforcement mechanism after a State has accessed to them. Generally, the effectiveness of the implementation and enforcement of those international conventions rests upon the national administration of a State that is party to them.

The implementation and enforcement of the international conventions are not an easy task for the national administration of each State. The failure usually exists because of a variety of factors. These factors which have been encountered include finances, personnel and technical expertise, delegation of authority, and institution of responsibility. For example, the RGC has not clearly offered accountability and authority to which ministry should be dealing with marine pollution by oil in the event of an oil spill incident.

Monitoring is a very essential key objective to identify whether or not international and national rules, regulations and standards have been committed. As far as the flag State concerned, one of the most important functions of the MoE, in collaboration with MPWT, is to establish a support infrastructure consisting of personnel and technical expertise, administrative instructions, inspection and survey of ships, and available resources for carrying out casualty investigation to ensure that the ships flying its flag comply with requirements of the rules, regulations and standards in accordance with the international and national regimes. Marine pollution by oil will be effectively mitigated by doing the above duties.

Another most important function is to set up an organization to deal with port State control, a mechanism for ensuring international standards are met and maintained, in order to ensure safe navigation and prevent marine pollution by oil from ships. The objective of the establishment of the port State control is to assist the flag States in enforcing standards of safety on ships flying their flag States. Generally, port State control and flag State are work in tandem as they have the same objectives. This means that port State control officers must act in a positive manner to ensure compliance with the requirements of the international and national regimes on foreign vessels that call at Cambodia's ports.

The most effective international regime to cope with the prevention and reduction of marine pollution by oil, which was accessed by the RGC in 1994 and entered into force in 1995, is the International Convention for the Prevention of Pollution from Ships 1973/78 (MARPOL 73/78). MARPOL 73/78 also creates an enforcement regime which is the responsibility of the flag State. MARPOL 73/78 approaches the issue of controlling ship pollution by oil, which is stipulated in Annex I, from two directions. Firstly, it seeks to reduce ship pollution by laying down procedures and restrictions which ships must observe when they are discharging ballast water and cargo tank

washings. In this case, flag State is empowered to detect and punish any ship which violates the operational regulations. Secondly, it is a direct approach relating to the technology to reduce and monitor vessel pollution. Tankers are required to be outfitted with either a double-hull or equally effective alternative means which places a heavy task upon shipowners.

To effectively carry out inspections, Cambodia as a flag State is periodically required to conduct thorough inspections before and after ships are put into service in order to make sure that structure, equipment, fittings, arrangements, and other materials of the ships fully comply with the applicable requirements of the convention. Furthermore, port States also have authority to conduct surveys the ships to verify whether they have carried a valid certificate or not.

Finally, punishment is the best component of the enforcement regime. It is necessary that investigation must be conducted by the flag States to verify the ship, which has illegally discharged oil into the sea, by bringing proceeding against the vessel. The flag States are required to impose penalties on the vessel, when punishing the ship, in severity to discourage violations of the Convention.

4.2.2. Preparedness and Response to Oil Pollution

The government is able to be effectively and sufficiently responsible for small size oil spills in case of having national plans. The local authority sometimes has enough ability to deal with small size oil spills without cooperation with others. In contrast, the national plans must be integrated into regional response arrangements covering two or more neighboring countries in order to effectively and sufficiently respond to very large oil spills; otherwise, the spills may cause damage to the marine environment and public interests.

For the largest spills, it is probably necessary to plan for specialized response equipment and the ability to move personnel and equipment resources to the scene of the incident. For instance, the response to the Exxon Valdez oil spill in Prince William Sound, Alaska in 1989 faced many difficulties. Those who attempted to coordinate the clean up were plagued with logistic matters in attempting to have access to international and domestic pollution response equipment. Therefore, providing a timely and rapid response to an oil spill emergency is such an important element that the government and response organizations must take into account when they establish the plans. The time lost during response will lead the spills to move out of control and the resources at risk that the plans had intended to protect will be left unprotected as the response is too late.

As mentioned in Chapter 2, Cambodia's coastline is located within the Gulf of Thailand which is close to the world's oil shipping lane through the Malacca Strait and the refineries and distribution centers of oil in Thailand. Furthermore, Cambodia is also an oil importer country and will be the country which is able to export oil in the future. Owing to equipment failure, the human factor or other conditions, spills might inevitably occur at the time of loading, discharging or bunkering, and as a result of collision, or grounding.

In order to improve capabilities to prepare for and respond to catastrophic oil spills, it is necessary that the RGC should accede to the international regime, namely the International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC) which was established under the auspices of the International Maritime Organization. The OPRC's main goal is aiming at facilitating international cooperation and mutual assistance in preparing for and responding to a major oil pollution incident and encouraging countries around the world to develop and maintain an adequate equipment or other facilities to cope with oil pollution emergencies.

When the RGC accedes to the OPRC, a national system for responding promptly and effectively to oil pollution incidents is required to be established. This will certainly assist the government in protecting the resources at risk, sensitive areas and public interests, which are in the vicinity of the incidents, from the effect of the spills. Besides the establishment of the national system, the OPRC also makes other provisions, such as oil pollution emergency plans for ships, offshore platforms, and sea ports; the facilitation of international cooperation and mutual assistance; oil pollution reporting procedures; exchange of information; and technical cooperation and training.

4.2.3. Cooperation

It is necessary that the RGC must provide a framework for cooperation among ministries, provincial and local authorities, and regional countries. The cooperation will help the government to effectively cope with the prevention and reduction of marine pollution by oil in the event of spills. For example, to prevent large scale oil spill incidents resulting from collision or grounding of tankers, double-hull structured tankers were initiated and approved by the international agreement.

Therefore, the RGC should make its effort to improve and strengthen the international cooperation system with neighboring countries, such as Thailand and Vietnam in order to effectively combat oil pollution as a result of spills in an emergency situation.

4.3. The International Compensation Scheme for Oil Pollution Damage

The 1969 International Convention on Civil Liability for Oil Pollution Damage (CLC) was adopted by the Diplomatic Conference in 1969. The main objective of the convention is to govern the liability of shipowners for oil pollution damage resulting

from spills of persistent oil from laden tankers. Persistent oils are, under the convention, defined as crude oil, fuel oil, heavy diesel oil, lubricating oil, and whale oil which are carried as cargo or bunkers.

By understanding the advantages of the CLC, the RGC has acceded to the convention. This means that if a pollution incident occurs involving a tanker within the Cambodian coastline, compensation is available to the government or other authorities which have incurred costs for clean-up operations and to private bodies or individuals who have suffered damage as a result of the pollution. However, it is important that the RGC must accede to the 1992 Civil Liability Convention as it provides a wider scope of application on several points than the old regime. Also, the limits of the shipowner's liability are much lower than the new one. For instance, just up to 14 million SDR is to be paid out in compensation to victims of accidents under the old regime, whereas the new one makes it possible to pay up to 59.7 million SDR.

Moreover, if Cambodia is a member of the 1992 Convention, Cambodia is able to claim for the compensation for the pollution damage caused by oil spill incidents which occur not only in the territory, but also in the exclusive economic zone or equivalent area of a State party to the Convention. The 1992 Convention covers pollution damage as provided in the old regime but environmental damage compensation is limited to costs incurred for reasonable measures to reinstate the contaminated environment. It also covers expenses incurred for preventive measures even if no spill of oil occurs, provided that there was a grave and imminent threat of pollution damage. For example, clean-up operation on shore and at sea is considered as preventive measures. If clean-up measures result in damage to roads or other things, it is also admissible.

Under the 1992 Convention, the owner of both laden and unladen tankers has strict liability for pollution caused by oil spill as a result of an incident. He is exempt from

liability only if he proves that the damage resulted from an act of war or a grave natural disaster, or the damage was entirely caused by sabotage by a third party or by the negligence of public authorities in maintaining lights or other navigational aids. It is also required by the Convention that the owner of a tanker carrying more than 2000 tones of persistent oil as cargo is obliged to maintain insurance to cover his liability.

To be sufficient, the RGC must accede to another international regime, namely the International Convention on the Establishment of an International Compensation for Oil Pollution Damage of 1971 and of 1992. The major goal of the 1992 Fund is to pay compensation to those suffering oil pollution damage in a State party to the Convention who does not obtain full compensation under the 1992 CLC. The maximum compensation available for a single incident under the 1992 Fund Convention is 135 SDR including the 1992 CLC.

In conclusion, the RGC must accede to the 1992 Civil Liability Convention and the 1992 Fund Convention as both conventions provide a wider scope of application on several aspects than the old regimes. The new regimes also have high limits of compensation.

4.4. The Role of Non-Government Organizations

A non-Government Organization plays an important role in preventing and protecting the marine environment by supporting the government or local authorities, such as technical guidance on the matters of the implementation of international conventions, shipping related activities, pollution management and control for land-based sources, and training in preparation for and response to oil spill incidents. In many developing countries, it is recognized that the monitoring and controlling efforts can not be effectively and sufficiently handled by the government alone because of mostly funding and human resource constraints. Thus, the non-government organization is required to

help by providing financial assistance and field personnel. For example, Cambodians has been working at the Programme Development and Management Office (PDMO), which is supported by IMO, since 1995 to improve their capabilities and skills in project development and management and a general upgrading of other technical skills such as word processing, geographical information system applications, and preparation of technical reports (UNDP, 1995).

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CHAPTER 5

PROPOSALS FOR IMPROVEMENT

5.1. Establishment of a Marine Environment Protection Division

5.1.1. Background

Oil production has presently been increasing by the demands of all nations around the world. A huge amount of the oil has been transported over the oceans. As far as oil transportation is concerned, marine environmental pollution by oil is inevitable as a result of shipping operations such as loading, discharging, bunkering and spill incidents. It has been shown that some, one or two million tons, of oil is released into the marine environment (Shaw, 1987).

As mentioned in previous Chapters, Cambodia has imported oil by sea and will be a country to have offshore installations within its territory in the future. It is therefore required that as soon as practicable a well-structured organization, namely Marine Environment Protection, be established to deal with marine environmental pollution in order to prevent ship spills, particularly ship operational discharges and, promptly and effectively respond in case of an emergency spill situation.

5.1.2. Organizational Structure

As mentioned in Chapter 3, the MoE is responsible for environmental aspects as a whole. It is therefore necessary that the MEPD should be under the authority of the MoE. The MEPD should consist of seven main offices as follows: Administration Office, Office for Emergency Preparedness and Response, Office for Contingency Planning, Office for Monitoring and Investigation, Office for Personnel Training, Office for Financial and Logistic Support, and Office for Research and Development (Figure 6).

5.1.3. Functions and Responsibilities

The purpose of the establishment of the MEPD is to help the RGC by providing a national integrated system for effectively and promptly responding to oil spill incidents in various locations such as oil exploration rigs, offshore platforms, pipelines, oil terminals, and oil within port area other than at terminals and oil which has been released in the territorial waters, and for preventing pollution by oil and for minimizing the pollution effects throughout the country.

The MEPD is responsible for establishing a national contingency plan (NCP) for preparedness and response which includes the organizational relationship of regional countries, public and private sectors. It is also responsible for monitoring the marine environmental pollution and developing policies for its protection. Besides oil, it is responsible for ballast water control, anti-fouling control and developing policies for the care and handling of dangerous cargo as well. It should be borne in mind that the MEPD has to ensure that the NCP is developed at regional, national, and local level.

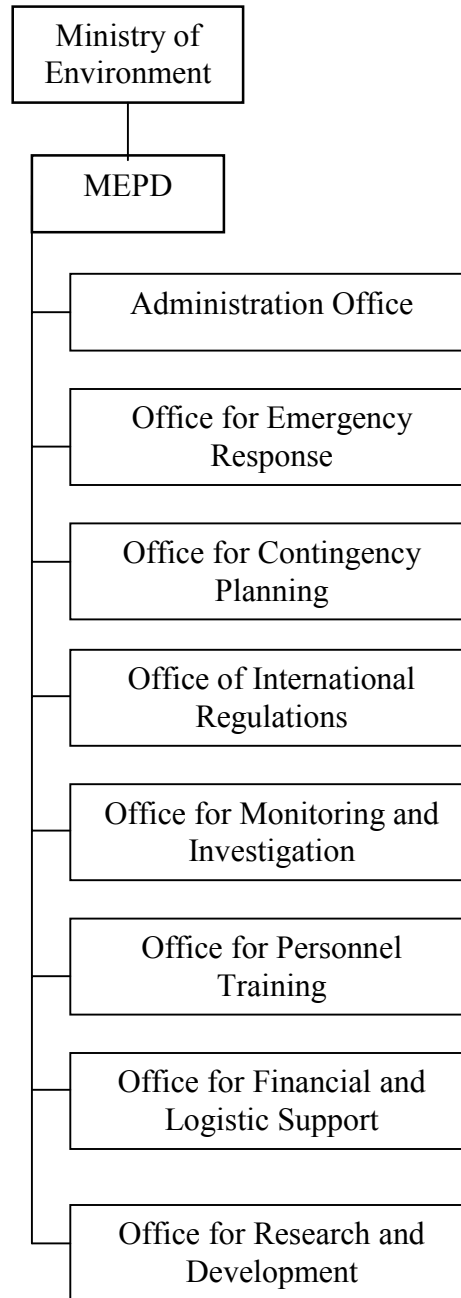


Figure 6. The Structure of the Marine Environment Protection Division

It is noted that operational response at sea and shoreline clean up need environmental advice and information. The MEPD is therefore in charge of offering advice on environmental aspects and impacts of these operations to other response organizations.

5.1.4. Scope of Activities

The principle activities of the MEPD are assigned as the following:

- Developing effective legal framework within the scope of its work providing strength and stringent restrictions.
- Integrating international conventions regarding marine pollution into national legislation.
- Ensuring that the compliance and enforcement of international and national regimes are achieved.
- Providing management, operational, technical and environmental advice and support to the team that is assigned to be responsible for responding to oil pollution as requested. For instance, when an oil spill incident occurs within the area of a harbor or local authority, the requirements of the deployment of national resources under national control will be requested because the action to be taken is beyond the capacity of the harbor and local authority concerned.
- Providing adequate communication systems during the occurrence of any pollution incident.

- Conducting, in collaboration with other organizations involved, oil spill investigation.
- Preparing and updating national contingency plans for oil spill response.
- Cooperating with regional countries, non-governmental organizations, and other public and private organizations.

5.1.5. Division Fund

Funding is a very important element for each organization to successfully achieve its mission within the scope of its work. The funding allocation for equipment and training programmes should be sufficiently supported by the governmental budget and other international organizations.

Division funding should be firstly financed by the government fund on a regularly year basis. Also, annual environmental taxes for oil tankers and other ships other than tankers are considered as financial element of the division fund. Another element which is able to finance the MEPD is costs for measures taken to reinstate the marine environment after an oil spill incident and other compensation covered by international legal regimes, including the 1969 Civil Liability Convention and the 1971 Fund Convention, and the 1992 Civil Liability Convention and 1992 Fund Convention. It is therefore required that the RGC should accede to the new regimes as soon as practicable which will enable it to get adequate compensation for oil pollution damage as a result of oil spill incidents.

5.2. Establishment of a National Contingency Plan (NCP)

Oil spills are inevitable even in small sizes because all countries around the world are always involved with the transportation of oil. Therefore, it is necessary that those countries must find effective response measures to cope with the spills. Development of a well-designed contingency plan (CP) is the most effective method to respond to catastrophic spills. The CP must be integrated into national response arrangements covering all levels, including local, regional, and international plans. The NCP must be developed beginning at the local level and working up to the high government levels and supported by the legislative and regulatory bodies.

According to the International Tanker Owners Pollution Federation (ITOPF), the effective CP can be divided into two main parts under the headings of a strategy and operational plan. The strategy plan should define policy, responsibilities, and rationale for the operation plan. An action checklist and reference to information sources are required by the plan (Figure 7).

5.2.1. Strategy Plan

The strategy section consists of assessment of spill risk, movement and persistence of oil, resources at risk, selection of response techniques, equipment requirements, manpower requirements, temporary storage sites and disposal options, outline of response organization, logistical support, and documentation requirements.

5.2.1.1. Risk Assessment

Risk assessment is a very important key task to be undertaken. The CP should take into account the locations of all potential spill sites and the estimation of the size of the

potential spills. Historical spill records for the areas covered by the NP are very useful to assist the assessment. Most spills result from tankers during routine operations such as loading, discharging and bunkering; therefore, the number of calls made by tankers is relevant (ITOPF, 1987). It is necessary to identify all environmental and commercial areas which can be affected by the spills. The CP should consider the analysis of the probable fate of oil slicks related to the type of oil and the prevailing seasonal weather conditions which can change the directions of tides, currents and winds during the spills.

5.2.1.2. Resource Prioritization

However, it is not possible to protect all resources affected by the spills at the same time, the priority of these resources must be taken into account. According to ITOPF, in order to understand the priority of the resources, the CP should identify such areas as amenity areas, ecologically sensitive areas, industrial sea water intakes, fisheries, mariculture, seabirds, marine mammal and other resources likely to be threatened by the spills. To be effective, maps of these sensitive areas are necessary to be attached in the CP.

5.2.1.3. The Requirements of Equipment and Manpower

The CP for the protection of the resources at risk needs to be quite detailed with the specific tactical strategies, including clean-up strategy with the most suitable equipment for oceanographic and meteorological conditions. Account is also taken of the amount of booms, skimmers, vessels, and equipment which are needed to engage in the operation. It is necessary to consider the location of equipment to ensure that a rapid and effective response can be achieved in an emergency situation. The time lost during response to the spills will cause extreme damage to the marine environment because the spills are moved out of control. The manpower for deploying the equipment and undertaking clean-up should be laid down in the CP as well.

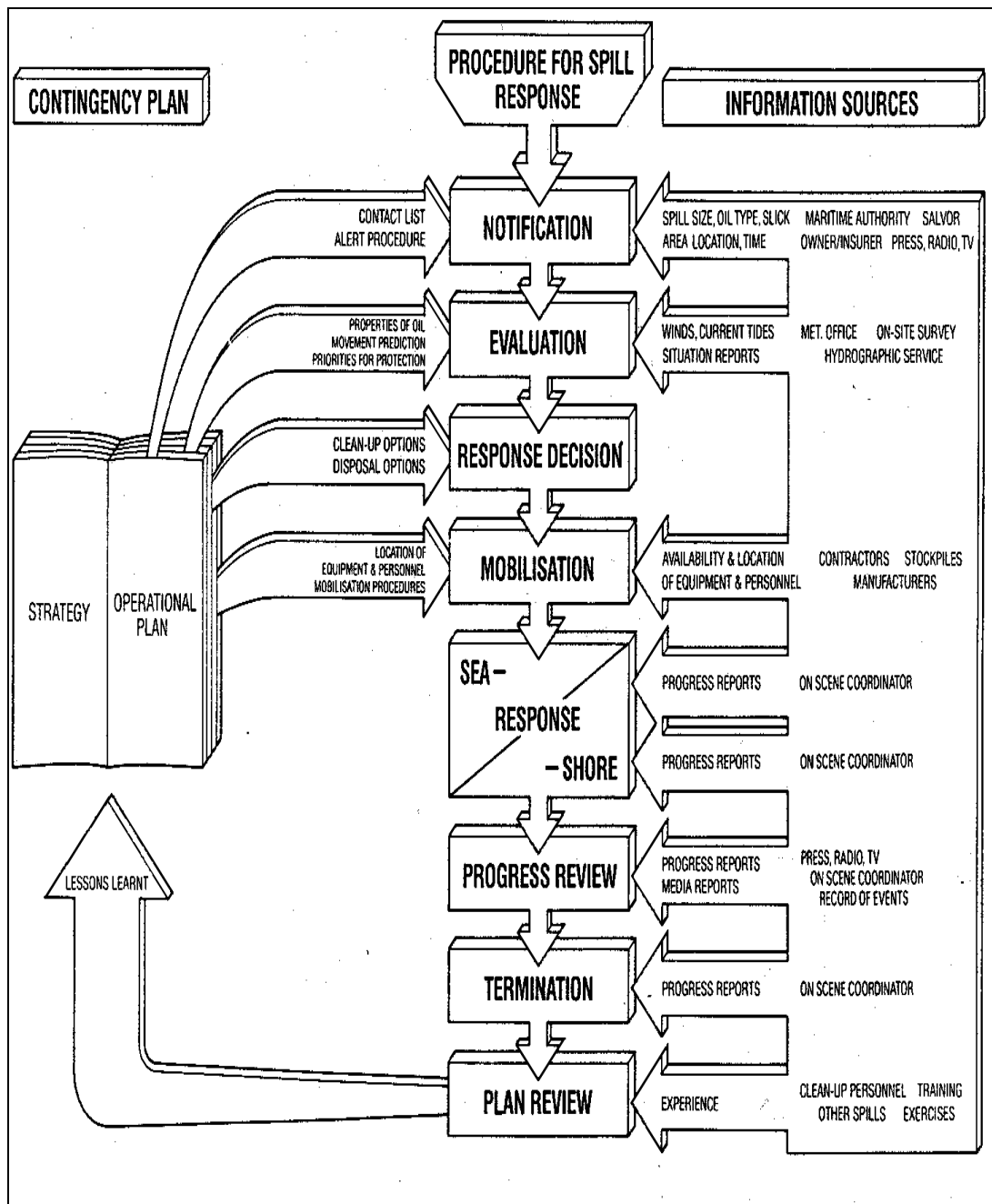


Figure 7. The Role of the Contingency Planning in Oil Spill Response (ITOPF, 1987).

5.2.1.4. Disposal Sites

The CP should also identify in advance the agreement of the temporary storage sites and disposal routes for oily wastes as well as the final disposal of those oily wastes. The disposal options should take into account the environmental and economical considerations of each method.

5.2.1.5. Response Organization

A well-structured response organization must be formulated and supported by the government in order to promptly and effectively respond to the incident. According to the IMO's Manual on Oil Pollution Contingency Planning, the response organization must be large enough and have sufficient financial support to cope with a pollution incident of a specified size and nature. The structure of the response organization is shown in Figure 8. The coordination between various response organizations should be laid down in the CP. The CP should also clearly define the accountability of the response organizations because everyone is eager to help during an emergency situation. To run the clean-up operation without facing any difficulty, logistic support must be taken into account when developing the CP.

5.2.1.6. Record Keeping

As far as oil transportation activities are concerned, the oil spill incidents are inevitable. It is therefore required to keep accurate records related to use of manpower, equipment, materials and related expenditure in order to make a fully quantitative assessment. Also, keeping the news media informed should be laid down in the CP in order to conduct the operation during the incident without any interfering.

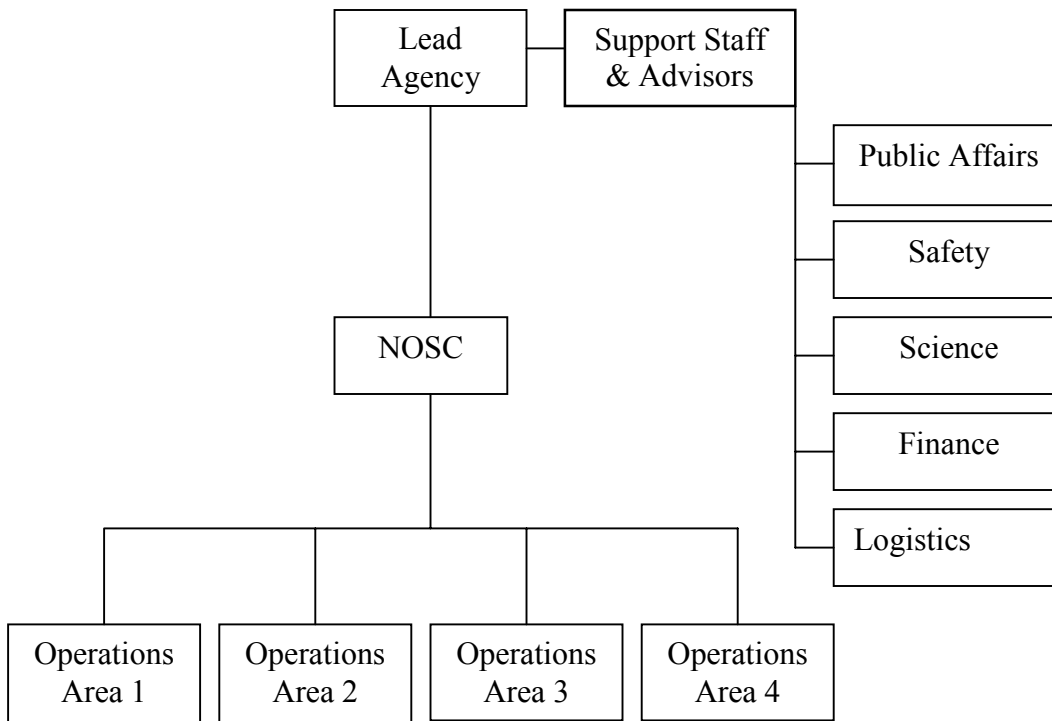


Figure 8. Incorporation of a Local Response Organization into a Large (Area or National) Organization (International Maritime Organization, 1995).

5.2.2. Operational Plan

5.2.2.1. Notifications

Information concerning an oil spill incident is very important for the response organization and may be offered through various numbers of sources. The CP should therefore lay down a format for an information report which contains such elements as date and time of the incident, position of the vessel, nature of the incident, the nature and characteristics of the pollution, weather and sea conditions, and reporter name.

The initial report consisting of date and time, position and source of the incident should be transmitted to the response organization without delay. The CP should take into account alert systems (IMO, 1995).

5.2.2.2 Spill Evaluation

It is important to understand properties of oil involved in the incident. The most important of these properties are specific gravity, viscosity, pour point, flash point, and solubility. The reason for this is that the properties and behavior of crude oil and refined oil are different. For instance, a specific gravity of light refined oil products such as gasoline is about 0.7 and crude oil may range from 0.8 to 0.98 (Sampson, 2000). This means that knowing the properties of the oil can help the responder to provide appropriate equipment to effectively handle the spill.

The CP should also take into account the weather and sea conditions such as wind, current, and tide at various times of the year. The priority of the threatened resources that might be affected by the spill should also be identified by the CP.

5.2.2.3. Response Decisions

Keeping in mind that the CP should identify clean-up techniques, such as the necessary equipment and the requirements of manpower, used to effectively and sufficiently combat the spill in certain circumstances. Account is also taken the key resources at risk to which should be promptly responded by the best equipment in order to prevent those resources from the effect of the spills.

5.2.2.4. Clean-up Operations

The CP should state procedures as the following in order to ensure that clean-up operations are smoothly conducted:

- Mobilizing the necessary equipment and related manpower;
- Deploying equipment at sea and on shore in conformity with response decision making;
- Organizing sufficient logistic support, such as supplying of fuel, food, and other consumables;
- Using aircraft to control clean-up operation at sea;
- Selecting the most appropriate disposal route and final disposal site;
- Making sure that communication systems are available within the whole area affected by the spill;
- Keeping daily accurate records for each clean-up operation which consist of the using of manpower, equipment, action to be taken, and other materials; and
- Returning the equipment to stores for cleaning and maintenance as well as replacing or repairing damaged ones.

In conclusion, an effective contingency plan can lead to success in a response operation during a spill occurrence. A developer of any CP should take into consideration all main elements as mentioned above and try to attempt to incorporate the Incident Command System (ICS) into the CP. The ICS is an effective and efficient system which assists the response organization in breaking duties and accountabilities for many different tasks out into carefully defined segments during the operations (Appendix 2). The most important point that the developer of the CP should take into consideration is that training sessions should be developed at all levels, and regular exercises should be conducted in order to ensure that the CP arrangements function properly.

5.3. The Requirements of the Resources

To successfully attain the objectives of the prevention, control, combat, and mitigation of the marine environment from the effect of oil pollution, the capacity building for staff should be developed and strengthened within the response organization. It means that capacity building development is a systematic approach to assist the MEPC to play a major part in the prevention of the marine environment from the effects of oil pollution.

The strengthening of the capacity building can be achieved through the establishment of training programmes both theory and practice at all levels, including local authorities, regional and national levels. For instance, the so-called "hands-on" training should be conducted to a crew to become proficient in the deployment and operation of particular types of equipment in the clean-up operation of an oil spill incident. In other words, to effectively respond to an actual oil spill incident, the frequent exercises should be done to enable responders to familiarize with the deployment and operation of equipment and to avoid mistakes that might occur.

The training programmes should also be fully integrated into university and research institution programmes in order to raise public awareness concerning the prevention, protection, and mitigation of the marine environment pollution by oil. The content of the training programmes should be properly designed to address a specific situation in order to achieve a standard of competency.

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CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

Most oil productions have been carried by seas because of huge demands by consuming nations around the world. The oil leak and oil spill incidents into the sea waters as a result of human errors are inevitable. Major sources of oil released into the seas mostly come from refinery effluents, the discharge of oily bilge water by ships, and deballasting and tank-washing operations of oil tankers and infrequently from oil spill incidents. As a consequence, these spills have an impact on the marine environment as a whole and on the public health in particular.

To effectively prevent, control and reduce marine pollution by oil, comprehensive and stringent specific regulations, rules, and standards for a specific area within the local circumstances must be put in place. The penalty sanctions within those regulations and rules must be more restricted. Furthermore, an organization dealing with marine pollution by oil must be established in order to enforce effectively the above regimes. As having been proposed by the author in this task, the so-called Marine Environment Protection Division must be set up. The MEPD must be provided with sufficient equipment and human resources.

Apart from the preventive measures, the response ones must be put in place beforehand to respond promptly and effectively to an emergency situation. The National Contingency Plan must be approved and supported by the legislative body within the country. The NCP should clearly define and be well-structured in order to succeed in a response operation. The NCP should be regularly tested, updated and improved.

6.2. Recommendations

Being aware and recognizing that marine pollution by oil affects ecological systems, economic growth, public health and country policy, and long term economic growth is essential to the prosperity of the Cambodians. Thus, the following recommendations should be considered:

1. The relationship between Parliament (National Assembly and the Senate) and the Government concerning legislation should be clearly defined. The lack of this issue will lead to the executive body facing problems during its mandate.
2. An organization or division dealing with marine environment pollution should be established as soon as practicable to achieve the protection, prevention, and mitigation of pollution by oil within the territorial waters of the Kingdom of Cambodia. The so-called MEPD should be well-structured and equipped with sufficient resources. Responsibility for response to spillage at sea and for developing suitable techniques should be given to the MEPD.
3. A national policy on marine pollution by oil should be developed and prioritized among other policies. It is necessary to integrate international conventions or treaties concerning the prevention and response of oil

pollution into national legislation in order to give effect to those conventions or treaties. In other words, the RGC is urged to accede to international conventions, including OPRC, the 1992 CLC, and the 1971 and the 1992 Fund Conventions. Regional agreements should also be accessed by the RGC to have close cooperation and coordination among neighboring countries to respond promptly and effectively in the event of an emergency situation.

4. The institutional and technical capability of national agencies should be developed and strengthened to enable them to effectively integrated marine environmental considerations into development plans. Capacity-building of national institutions responsible for marine pollution by oil should be developed and conducted through regional and national training assistance programmes. In other words, adequate training at all levels in public and private sector organizations with the aim of improving their expertise and skills of environmental management on the marine pollution by oil. Also, greater information and data exchange concerning oil pollution monitoring should be encouraged.
5. Sharing of technical information, initiating joint training and research programmes, and exchanging expertise in the marine environmental monitoring should be improved.
6. Public awareness of marine pollution by oil should be fully integrated into university and research institution programmes. The content of the programmes should be properly designed to achieve a standard of competency.

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