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AN OVERVIEW OF MARINE POLLUTION  
ASPECTS IN INDONESIA

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by  
JANSEN SINAGA  
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A paper submitted to the Faculty of the World Maritime  
University in partial fulfilment of the requirements for  
the awarded of a

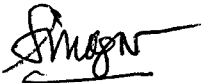
MASTER OF SCIENCE DEGREE

in

GENERAL MARITIME ADMINISTRATION



The content of this paper reflect my personal view and  
are not necessarily endorsed by the university

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Malmo Sweden, October 1988

Jansen  Sinaga

GMA.1/88



## CHAPTER.I

### INTRODUCTION

#### 1.1.GENERAL

As we know that in recent years a number of accidents involving oil tankers,storages,tanks and pipelines have resulted in the introduction of relatively large quantities of oil into our environment.

Incidents of this type together with the growing use and transportation of petroleum products throughout the world have created an almost global awareness of the risks and damages associated with oil spill.

However,consumption of large quantities of oil is one of the necessities of population in Indonesia and our industries. At the same time our oil exploration and exploitation on shore and offshore will undoubtedly continue to get petroleum and petroleum derivatives as energy sources.

Consequently the threat of oil pollution is not likely to disappear in the foreseeable future.Prevention of oil spill is clearly the most logical method of reducing the problem of oil pollution.

Through training programs,properly maintained equipment,adequate alarm system and strict adherence to oil industry,government codes,all make essential contributions to the prevention of oil spill.

In an effort to curb pollution of our land,waters and

coastal areas by accidental oil spillage the government of Indonesia has issued Law No.4 of 1982 concerning the basic provisions to organize life environment (L.N. No.12 th.1982 TLN No.3215.)

The oil industry and ships have simultaneously focused attention on the improvement of operational procedures and the design of handling and transportation equipment.

Inspite of measures, such as tank cleaning deballasting procedures etc, several sources have estimated that 75 % of all spills are directly or indirectly attributable to human error.\*1

This is an extremely important observation. It clearly indicates that even if near perfect technology existed and oil spills resulting from technical failures could be eliminated, spills resulting from negligence and human error would still be difficult to overcome.

Technological development of rapid and efficient clean up methods are major objectives of the petroleum and transportation industry.\*2

Pollution of the marine environment particularly from oil can cause several problems. The effects arising from oil are especially essential and cause serious problems with respect to fisheries. The loss of marine foods implying decreasing in the total quantity and quality of marine yield available to human beings as well as particularly the loss of revenues of fishermen.

Marine pollution can cause damage<sup>?</sup> to port installations and as well ships. Besides the fact that researchers carry out investigations to find suitable means to prevent marine pollution and protect against disturbances imply an important financial effort for the state.\*3

The tourism industry can be damaged when pollution reached to the beaches impair such activities and all other activities connected to tourism.

This will cause social problems because people who wanted to spend their holidays at the beach will be forced to stay at home . *not necessarily*

The local government will be forced to get less earnings due to the less number of people who come to visit the beaches any longer. Health problems must also be taken into account.

Anyone should bear in mind what happened in Minamata Japan ,where some people died and several were seriously sick after having eaten fish contaminated by mercury released in sea water.

In attempt to avoid those above mentioned adversities state have initiated some preventive and protective measures which will be elaborated in subsequently chapters.

## 1.2. GEOGRAPHICAL SITUATION AND POPULATION

### 1.2.1. GEOGRAPHICAL

Indonesia consists of thousands of island spread all over the Indonesian waters. In total the country comprises 13.667 islands ,in the vast sea areas extending approximately 5000 kilometres from east to west approximately 2000 kilometres from north to south .\*4

Indonesia is the world's largest archipelago and is situated in equatorial area between the two continents of Asia and Australia.

Along its western and southern coasts it has on one side the Indian Ocean, to the north it faces the straits of Malacca and the South China sea on the remote northern shore of west New Guinea.

It directs frontage on the Pacific Ocean. Furthermore the nation's location across important trade routes has influenced its political and economic development.

The country covers by sea and water areas about 3.64 million square kilometers and land area approximately 1.56 million kilometres and the length of the coast line is 33.007 nautical miles.

The total land area of Indonesia is about 735,2267 square miles or 1,904,345 square kilometers .Geographically the Indonesian archipelago comprises six main islands,13,661 smaller ones , 6.044 have names and only 931 are inhabited.\*5

As a maritime nation, the economic growth is completely dependent upon sea transportation.

#### 1.2.2. POPULATION

The present population in Indonesia is 165 million, according to a survey carried out by national census in 1981. The growth rate every decade showed 2.10 % and an increase of 2.32 % from 1971 to 1981 ( see annex 1.2.1) \*6.

The distribution of population is concentrated in Java , Bali and Sumatera. With regard to population density per-square miles Java has 690 followed by 96 in west Nusatenggara, particularly Bali and by 59 in Sumatera.

On the basis of the result of the 1981 population census, the population of Indonesia has grown more and more i.e 147.490 thousand with an annual growth rate of 2 per-cent future prediction as a forecast of population up to 2000.

In 1987 according to a press release of the Minister of Indonesian information the total population of Indonesia is 165 million.

In the fourth Five Development Plan ( REPELITA ) which started in 1984, the annual growth of population is predicted to 2 % or less at the end of Repelita IV; This rate is considered to be reasonable from the view of the present situation.

As clearly shown in annex 1.2.1 and annex 1.2.2 the distribution of population is concentrated in Java and Bali. Java has 91.269 thousand people accounting for approximately 62 % of the total population of Indonesia.

### 1.3. REASON FOR CHOOSING THIS TOPIC

The reason for the writer to choose An Overview of Marine Pollution Aspects is that in Indonesia up to now ,as far as my concern ,it is not quite clear who is responsible for preventing and controlling marine pollution .

As I mentioned before Indonesia is the largest archipelagic in the world comprising thousands and thousands of islands with 2.941.416 square miles of claimed sea territories.

As the largest archipelagic country in the world we have 7,890 ships which are sailing in Indonesian waters all year round plus approximately 40.000 foreign ships and 8000 oil tankers passing through the Malacca Strait and Lombok Strait.( see annex 1.3.2 ).

All those ships are sources of marine pollution.With respect to this the Directorate of Marine Safety under the Directorate General of Sea Communications, has been given responsibility,as one of its main functions to prevent and control marine pollution particularly discharged from ships.

As an employee working in this department ,I would like to contribute a little of my knowledge and experience during my field trips and on the job training in several countries dealing with control and prevention of marine

pollution by oil from ships.

Furthermore this study intends to present the different steps to be followed and measures to be taken by my government i.e the Directorate of Marine Safety in order to reduce or to eliminate the danger or damaged caused by pollution.

Pollution has many sources which means that many different methods should be employed, therefore the Directorate of Marine Safety should be able to find the best practical ways to prevent and combat marine pollution. The proverb says " Preventing is always better than curing ". Taking into consideration the fact that marine environment is a part of the environment in general. For this reason ,the writer would like to choose this topic by trying to give a presentation of the environment in this project.

#### 1.4.RESEARCH METHOD

The author tries to get data and information in order to describe and elaborate this project by using the three method as follows:

##### 1.4.1.Library research.

Studies from books by using the library at World Maritime University. In this research method which has been done by collecting some important data related to information such as; reports, literatures, magazines, brochures, material from hand-outs which were given by the lecturers, visiting professors and resident professors.

1.4.2. Studies from the reports of the research which was done by various institutions and some information which was obtained during on-the-job training and on field training.

#### 1.4.3. Field research

On the spot research at the Directorate General of Sea communications office of Indonesia in Jakarta during the winter break and some experiences of the writer during 10 years working at the Directorate of Marine Safety under the Directorate General of Sea Communications.

#### 1.5. STAGES OF CONTENT.

With regard to discussion of this project in order to get the systematic and clear picture of this project chapter by chapter, which describes how dangerous and serious the impact of marine pollution and how far the international, national and regional institutions involved in preventing and controlling this case.

This project is divided into seven chapters which can be summarized as follows;

Chapter. I : The introduction deals with the general idea in order to describe the geographical situations and population background and , reasons for choosing this topic, research methods and stages of contents.



Chapter.II: Briefly deals with the present organizational structure of the Ministry of Transport, the Directorate General of Sea Communications and Directorate of Marine Safety at the main office, regional offices and ports and their main functional tasks respectively.

Chapter.III: Deals with the definition of marine pollution, marine ecology and marine environment. Categories of pollution, pollution by dumping at sea, land based pollution, ship generated pollution, pollution from sea bed activities and pollution through atmosphere.

Sources of marine pollution causes of marine pollution, type of pollution, biological zones.

Chapter.IV. Deals with the effect of oil pollution on the marine environment, how oil behaves at sea, how it is spreading and weathering, evaporation and oxidation.

How oil pollution has effects on fish and shellfish population on fishery. What the impact of oil pollution into the tourism industry, benthic environment, impact on mangroves, hydrocarbon and on bacteria and phytoplankton.

Chapter.V: Measures to combat and control marine

pollution. Contingency plan, containment, recovery and restoration.

In this case the writer elaborates on shoreline sensitivity, behaviour of oil in shoreline, biodegradation by bacteria, shoreline protection method and shoreline protection.

Chapter.VI: How far and what kind of organisation is involved in preventing oil pollution, international organisations, national organisations and intergovernmental organisations.

Chapter.VII: Conclusion of the all chapters, suggestions, and bibliography.

References to chapter.I

- \*1 . Sharan Galenzosky, The Basic of Oil Clean up, Environmental Protection Service Canada, 1979.
- \*2. Sharan Galenzosky, Ibid. page 5.
- \*3 . G.Kullenberg, The Health of the Ocean and the need for its monitoring, October 1983 page 11.
- \*4 . Phipat Tangsubkul, Asean and The Law of the Sea page 9.
- \*5 . List of Island names by Directorate of Naval Hydrography, Pusat Dokumentasi Ilmiah National, Jakarta 1975.
- \*6 . Statistic Indonesia 1982.

## CHAPTER. II

### PRESENT ORGANISATION STRUCTURE OF THE DIRECTORATE OF MARINE SAFETY UNDER THE DIRECTORATE GENERAL OF SEA COMMUNICATIONS

According to the Ministerial Decision No.KM.164/OT-102/PHB.80 and their meaning concerning the organizational structure of the sea communications sector, the general allocations of management functions to the different levels of organisation units shall be as follows;

The Directorate Shipping and Marine Safety is under the Directorate General of Sea Communications and the Directorate General of Sea Communications is under the Ministry of Communications.

The organisation chart of the Ministry of Communications can be seen in annex II-1.

The Directorate General of Sea Communications (DGSC) which is one of the three directorate general within the Ministry of Communications, assuming the main role in performing described Presidential Decree or the so called Keputusan Presiden (Keppres) No.44/74 relative to the management of the sea communications or maritime sector in the country.

The sea communications sector encompasses all aspects of operations, technical implementation general management in the fields of shipping, ports, docks and ship-yards.

As the agency responsible for the overall management of

the sea communications sector, the Directorate General of Sea Communications head office has the following objectives as derived from the functions described in the Ministerial Decision or Keputusan Menteri ( Kep Men ) KM- No.164/OT-02/Phb-80 which implements Keppres 44/74.

## II.1. HEAD OFFICE

It can be shown in the chart of the present organisation annex II-1-1, the Directorate General of Sea Communications head office consists of six directorates ,they are as follows ;

1. Directorate of Shipping and Marine Safety
2. Directorate of Sea Traffic
3. Directorate of Ports and Dredging
4. Directorate of Navigation
5. Directorate of Maritime Services and
6. Directorate of Coastguard and Sea Patrol

The Secretariate to the Directorate General of Sea Communications which assists and provides managerial support to the Director General ,consists of six division ,they are as follows ;

1. Planning division
2. Personnel division
3. Finance division
4. Material division
5. Legal division
6. General affairs division

In this project the writer tries to elaborate the Directorate of Shipping and Marine Safety which is responsible

for prevention and control of marine pollution from ships by oil in Indonesian waters.

This Directorate consists of five sub directorates and issues ships certificates in accordance with international conventions and national legislation. It regulate registration, measurement of ships transfer of titles to ships and it is in charge of marine pollution prevention as well.

As shown in the chart of the organisation ( annex II-1-2) the Directorate of Marine Safety consists of some sub-directorates as follows ;

1. Sub Directorate of Nautical, Technical and Radio equipment (NTR) .This sub directorate (subdit) is responsible for inspection of ships, such as nautical inspection, technical inspection, radio equipment inspection and issuance of relevant certificates of ships.

2. Sub Directorate Sea Worthiness.

This sub directorate inspects and regulates the sea worthiness of ships, e.g. hull, engine, electrical installation, ship's stability, free-board and cargo handling gear.

3. Sub Directorate of Ship measurement and Registration.

This sub directorate is responsible for the measurement and registration of ships. It controls transfer of the title of the ships, nationality of ships and her call-sign.

4. Sub Directorate of Seamen and Harbours (Ports ). This sub directorate is incharge of the enforceement of law and order in ports ( harbour ) and the handling and storage of dangerous cargoes in ports.

It controls and regulates the certification of fleet personnel,their conditions of employment and work permits for foreign fleet personnel on Indonesians vessels. It conducts investigations into ships accidents at sea and verifies the revenues of the harbour masters.

5. Sub Directorate of Sea Pollution.

This sub directorate provides guidance for the prevention of pollution and the removal of floating obstacles at sea,pollution treatment and records of cases of sea pollution.

## II.2. REGIONAL OFFICE /KANWILHUBLAS.

For the extension of the functions of the Directorate General of Sea Communications in the provinces nine regional offices were established upon issuance of the Ministerial Decision No.KM.407/4/Phb-76.

The country is divided into nine maritime districts,each with a maritime distric office or Kantor Wilayah Perhubungan Laut (Kanwilhubla) organized in a similar manner as the Directorate General of Sea Communications.

The location of the Kanwilhublas are as shown in annex II-2-1

As an extension of the directorate general of sea communications each regional office provides technical or administrative assistance to each port within its jurisdiction but it does not exercise direct control or supervision of the ports.

As a regional representative of the Directorate General of Sea Communications, the primary role of the regional office (Kanwilhubla) is to facilitate the extension of the DGSC functions taking into account problems posed by geographical locations and distances of ports from the seat of the National Government.

Regional Office (Kanwilhubla) is responsible for the implementation and follow up of DGSC (Directorate General of Sea Communications) activities on a regional basis. This includes detailed routine planning, licensing, monitoring, - coordinating as well as directing of the operational units, so the management and the managerial support services of Kanwilhublas refer to planning, coordinating and controlling functions being exercised by nine Kanwilhublas.

In accordance with KM.407/4/Phb-76 each Kanwilhubla is organized as shown in annex II-2-2. Those Maritime District Office has five divisions as follows ;

1. Sea Traffic and Transport division
2. Marine Safety and Maritime Service division
3. Ports and Dredging division
4. Navigation division
5. Coastguard division



### II.3. PORTS.

There are 91 ports scattered all over Indonesia. They are small and big ports. Ports are classified into five classes according to the activities and its facilities which are available. There are four gate ports, such as Belawan port, Tanjung Priok, Ujung Pandang port, and Tanjung Perak .

A public port administration should be as autonomous as possible and financially self sufficient, except for major capital investments. It can be considered the "Landlord" of the port, which owns all infrastructures and superstructures of the port.

In this function, it provides the necessary length of quays with associated depth alongside storage areas, buildings, port security and all other related matters; and maintenance of port facilities.

According to commercial principles, basic governmental control should be such that it enable the port administration to manage efficiently and to follow a steady, consistent program of port development without deviating from the general economic policies of the government and without neglecting broad national interest for the benefit of financial or commercial interests of the port system.

A total of 91 ports in Indonesia are administered by Port Administrations, sub-divided in classes of ports, according to size:

Class 1 = 4 ports

Class 2	= 12 ports
Class 3	= 17 ports
Class 4	= 22 ports
Class 5	= 36 ports
Total	= 91 ports

The Port administration in Indonesia is responsible to the Directorate of Ports and Dredging, in the Directorate General of Sea Communications, and is the executive arm of the directorate.

The port administration is responsible for the management and development of the port, including private piers, and provisions of the required environment for efficient and safe transfer of goods and passengers between ships and land transport.

The port administration is self-sufficient in term of income and outlays, and transfers excess cash to the Maritime District Office or directly to the local representatives of the Ministry of Finance. Incomes consist of port dues, fees, charges and rentals for the facilities and equipment they own.

This equipment is rented to terminal operators, who take care of cargo-handling, if they do not have sufficient equipment. The port administration licences Indonesian's shipping companies to handle cargo over designated berth.

For this purpose Indonesian shipping companies have a separate section for terminal operations, in their organisation. The terminal operators are also licensed to use designated storage facilities. Storage charges are paid by the cargo-owner to the port administration, which

credits 20 percent of these charges to the terminal operator for their management of their storage.

Use of channels, basins, and quays is charged directly to the vessel and is paid through the shipping company of the vessel. In addition the port administration provides auxiliary facilities, where required, such as fuel and water for ships, personnel for mooring and unmooring and other necessities for the shipping companies.

#### II.4. DEVELOPMENT OF PORT ORGANIZATION

The Government established 4 Perum Ports which shall carry out the management and related plannings for the four gateway ports; Tanjung Priok, Belawan, Surabaya and Ujung Pandang, including the approximately 92 related port administrations. A fundamental charge affecting the Port Administration is contained in Government Regulations 14, 15, 16 and 17 published in 1983, formulating the incorporation of four port Perums (Pecusahaan Umum Pelabuhan).

Each of these PERUMS will manage a geographical groups of ports;

- PERUM-I, located in Medan, managing 21 ports in the provinces of Aceh, North and West Sumatera and Riau.
- PERUM-II, located in Jakarta, managing 17 ports in the provinces of Jambi, South Sumatera, Bengkulu, Lampung, DKI, West Java and West Kalimantan.
- PERUM-III, located in Surabaya, managing 36 ports in the provinces of central and esat Java, South East Kalimantan, Bali, West and East Nusatenggara and East Timor.
- PERUM IV, located in Ujung Pandang, managing 17 ports in the provinces of South, South East, central and north Sulawesi, Maluku and Irian Jaya.

In line with the Government Regulations above mentioned,

the Ministerial Decree (Kepmen) No. 194/T.001/PHB-83 has been issued and states the following principles:

1. The ports are owned, regulated and operated by the government.
2. The Minister of Communications is carrying out this function and transfers the planning, developing, operating and controlling to the Port Perums of which he is the superior.
3. The Minister of Communications appoints the President Director of each Port Perum.
4. The Port Perum shall act as autonomous entities being responsible for the following functions; -Planning and development of port facilities. -Commercialization of facilities and services. -Establishment of their own port tariffs to be approved by the Minister. -Financing of own investment. The nature of a PERUM in general is a public corporation with all the capital owned by the government. Its Board of Directors is directly responsible to the Minister. The PERUM has no permission to transfer assets to other enterprises and should be financially self-supporting. The tariff and charges which are levied by the PERUM are regulated by the Minister. The government provides a subsidy to the PERUM if the operation of the PERUM results in a loss. The Board of the Perum is appointed by the President, and Perum personnel are appointed by the management of the Perum, subject to ministerial approval. All perum personnel have the status of civil servants. In the case of the Perum Pelabuhan, regulation 14, 15, 16 and 17 state that the capital of the PERUM will consist of the government assets in the ports.

## CHAPTER. III

### MARINE POLLUTION, MARINE ECOLOGY AND MARINE ENVIRONMENT

#### III.1. MARINE POLLUTION.

##### III.1.1. DEFINITION.

In this respect marine pollution means harmful substances or any substances which if introduced into the sea, is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.\*.1

##### III.1.2. CATEGORIES OF POLLUTION.

The major categories of pollution can be listed as follows ;

- Domestic sewage
- Pesticides
- Inorganic wastes
- Oil and oil dispersants
- Radio active materials
- Petro-chemical and organic chemical
- Organic wastes
- Military wastes
- Heat
- Detergents
- Solid objects
- Dredging spills

- Inert wastes

### III.1.3. SOURCES OF MARINE POLLUTION.

In general five sources of marine pollution have been categorized as follows;\*2

#### III.1.3.1.POLLUTION BY DUMPING AT SEA.

Pollution by dumping at sea i.e marine pollution caused by the disposal of industrial and municipal wastes at sea from ships which have been loaded at land with the purposes of dumping the material at sea.

#### III.1.3.2.LAND BASED POLLUTION.

Land based pollution i.e marine pollution by substances or energy finding their way through run-offs from land by rivers, pipelines and outfall structures.

#### III.1.3.3.SHIP GENERATED POLLUTION.

Ship generated pollution, i.e marine pollution by operational discharges from ships, e.g by cleaning of tanks or deballasting and accidental pollution following ,for example collision or grounding of ships.

#### III.1.3.4.POLLUTION FROM SEA BED ACTIVITIES.

activities. Pollution from sea-bed activities, i.e marine pollution by the release of harmful substances directly arising from exploration exploitation and associated off-shore processing of sea-bed minerals.

#### III.1.3.5.POLLUTION THROUGH FROM OR THROUGH ATMOSPHERE.

Pollution from or through the atmosphere i.e marine pollution by the release of harmful substances or energy affecting the marine environment originating from man's activities on land, ships, hydroplan or aircraft.

Pollution is mostly the result of man's activities. Pollution can be intentional such as disposal of sewage or chemical effluents, accidental as agricultural run-off of pesticides or fertilizers.

As the major categories and some of the marine pollution types have been outlined, it is quite necessary to point out the causes and the types of pollution.

#### III.1.4.CAUSES OF POLLUTION.

- Error of judgement
- Tiredness
- Negligence
- Inadequate training
- Sabotage
- War
- Poor design
- Poor maintenance
- Mechanical failure
- Storms

- Floods and earthquake.
- Deballasting of ships
- Cleaning of ship's tank
- Accidental of ships
- Oil and gas exploration and exploitation activities.
- Wastes of oil refinery
- Wastes of industries.

### III.1.5.TYPES OF POLLUTION.

To illustrate the major categories of pollution I would like to give some figures of pollution occurring in different parts of the world.\*3

Indonesia;

Bad pollution around Indonesia beaches from the untreated sewage and heavy industries on the coast.

Bombay(India); Indian ocean,mercury lead and copper contents are high in the Bombay harbour and large quantities of domestic wastes are discharged.

Oil slicks and tar balls in high concentration along the coastline of Southern India.

Agabras and Natal; Tar balls and mats are common on the beaches of Cape Agabras and Natal; It is a major tanker route from the Middle East to Europe.

The Gulfs.



Severe oil pollution as a result of oil spillages from ships, rigs, seepages, refinery discharges and blow-out.

Red Sea. Pollution is almost critical in the Red sea because of industrialisation. Highly toxic industrial wastes.

Rio de Janeiro /Santos Brazil. The increasing population of the areas of the Rio de Janeiro/-Santos Brazil has produced heavy and increasing organic pollution from sewage .

Central America and North East of Brazil. River pollution in north east Brazil and Central America from discharged of waste materials from sugar cane alcohol production.

West African coast. Pollution of the African coast from industrial and agricultural waste and sewage also oil from tankers discharges and spills.

Guyana.

River disposition in Guyana from mining.

Lake Maracaibo.

Industrial seepages and oil pollution.

New York and New Jersey (USA). Massive quantities of sludges from sewage treatment are dumped off.

Atlantic Ocean.

Most of the sold radioactive wastes, principally from the United Kingdom but also from other European countries is dumped from ships into a designated area of the Atlantic.

Gulf of Thailand. Untreated sewage and pollution from tapioca flour mills and tarballs. Pacific Ocean. Japanese and Soviet fishing vessels have discharged litter in the Northern Pacific and steadily increasing the level of municipal and industrial waste in Japan.

Chinese Coast. The Chinese coast is badly polluted by heavy metals from shore based activities.

The Philippines. The Philippines mining and high sedimentation of minerals and tailings from Philippine mining.

Dumping of radioactive waste by Japan in Marianas but stopped after international pressure.

Sydney (Australia). Heavy pollution in Sydney by sewage from inadequate municipal system.

British Columbia. Uranium mining in British Columbia has produced radioactive waste and mining tailings.

San Francisco Bay (USA). San Francisco Bay suffers from input of sewage of heavy metals, mercury, lead, zinc, cadmium, and copper as well as sewage effluents.

Guatemala. Pulp waste from coffee processing in Guatemala considerable organic pollution in Chimbote Bay (Peru). Copper tailings from mining in Chile.

### III.2.MARINE ECOLOGY.

#### III.2.1.DEFINITION.

Marine ecology concerned with interrelationship of organism and their environment, especially as manifested by natural cycles and rhythms, community development and structure, interaction between different kind of organisms, geographic distributions and their environment.\*4

#### III.2.2.NEAR SHORE

The nearshore zone includes the intertidal portions of the coast estuaries and areas that are closed by land masses, such as harbour bays, lagoons and passage of water separated from the open sea by fringing islands.

#### III.2.3.THE DEEP SEA.

Local topographic features of sea mounts and canyons and each oceanic basin has ridges and trenches which correspond to the arrangement of the tectonic plates.

The sea floor slopes in the deep sea slopes are fairly steep, 3 degrees to 6 degrees to the horizontal to form the continental slope.

#### III.2.4. CONTINENTAL SHELF.

The sea floor out as for the continental margins. The submarine portions of the land masses constitute the continental shelf. It contains some large marginal seas as well.

#### III.3. MARINE ENVIRONMENT.

##### III.3.1. DEFINITION.

The word environment has come to mean widely different things to different people there are three components, as follows; \*5

Firstly, current milieu, which has to be preserved at all costs in condition as unchanged as possible.

Secondly, natural order of things, the combination of external circumstances which are as often adverse as favourable for such human affairs as food production and maintenance of life and which have to be fought against in terms of pests, disease and disasters.

Thirdly, environmental factors, those exercised by the long history of

development of the continents and oceans;

The changes of physical time to the present have left their influence on the distribution of elements both useful and useless, and which have direct effect or relevance to their employment for human welfare.\*5

### III.3.2. BIOLOGICAL ZONES.

In biological zones there are pelagic zones and benthic zones. Marine organisms which either float or swim in the water mass are termed pelagic. They are Necton and the Plankton. Planktonic organisms such as plant are called phytoplankton and animal are called zooplankton.

### III.3.3. BENTHIC ZONES.

Marine organism which live in the sea-bed are termed benthic. The benthic fauna is usually subdivided into animals which live on the sea-bed. They are called the epifauna.

And those which live in the sea-bed is the infauna. The benthic animals which live in the shelf occur in groups of species that are characteristic of depths of water and type of sediment.

### III.3.4. PELAGIC ZONES.

Pelagic organisms are referred to the terms of those organisms which are strong swimmers constitute the necton and those which are weak swimmers or float passively are called plankton.\*6

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## CHAPTER.IV

### EFFECT OF OIL POLLUTION ON THE MARINE ENVIRONMENT

#### IV.1.HOW OIL BEHAVES AT SEA.

Oil is a complex material and each component has a special fate when spilled on the sea's surface. Light oil spilled into water spreads onward from its sources until it appears as a silvery sheen on the surface of calm water. The effect of oil in the marine environment depend on the nature of oil and the physical as well as the biological environment.\*1

##### IV.1.1.SPREADING.

Light oil spilled onto water spreads outward from its source until it appears as a silvery sheen onto the surface of the calm water.

British experiments into the rates at which oil spreads at sea showed that small oil slicks move along the surface faster than oil spreads out and that currents,winds and tides have more to do with this moment than do the oil spreading characteristic.

The effect of tides is more or less cancelled out by the ebb and flow of their currents.The long term pattern of oil pollution coming ashore corresponds predictably with seasonal changes in the strength and direction of ocean



currents.

Furthermore, calculations made on the drift of oil from the sunken oil tankers, Torrey Canyon showed that it moved in the direction of the wind, at 3.4 percent of the wind's speed .

A great deal of effort has gone into the development of oil slick movement models.

However because the number of factors influencing slick movement and the absence of accurate current and wind data at the site of an oil spill, this model can seldom do more than predict general trends during actual oil spill conditions.\*2

#### IV.1.2.WEATHERING.

The moment oil is spilled upon the sea's surface a number of physical and biochemical processes begin which, in effect reduce the concentration of the oil within the environment.-

These processes are known collectively as weathering. Crude oil is not a pure-chemical compound but consists of hundreds of fluids made up of water and carbon and dissolved gases.

Individual petroleum hydrocarbons fall into four general classes because of common features in their molecular structure, olefins, paraffins, naphthenes, and aromatic.

The molecular structure of these compounds, in turn influences the specific boiling point gravity and viscosity of each constituent of crude oil.

Thus crude oil is refined into such products as gasoline, fuel oil and lubricants within a defined boiling point range and according to specific gravity and viscosity.

As mentioned above crude oil contains dissolved gases which can vaporize at atmospheric pressure, as well as a number of metals including sulphur, nickel and vanadium.

Weathering, then varies in intensity according to the type of oil spilled and the meteorological and water conditions at the time of the spill.

Forms of weathering include evaporation, dissolution, emulsification, oxidation and biodegradation.\*3.

#### IV.1.2.1. EVAPORATION.

This is the loss to the atmosphere of those components of the crude oil which have relatively low boiling points, referred to as light ends.

Evaporation can reduce the total volume of crude oil by 25% within one day. This pecen-

tage can be higher depending upon the volume of dissolved gases such methane, propane and the tempature of the sea water, water conditions and winds. Products such as gasoline can evaporate by half of their original volume in warm weather.\*4

#### V.1.2.2. DISSOLUTION.

Only a small proportion of the hydrocarbon constituents of oil are soluble in water, so only a very small part of the total spill can dissolve into the water.-

However, this small amount is significant when we consider that oil is toxic to certain forms of marine life.\*5

#### IV.1.2.3. BIODEGRADATION.

Each type of micro organism can break down or degrade, only one or two hydrocarbons found in oil. Nature provides sufficient diversity within the overall microbial population. However to completely degrade all the different hydrocarbons found in oil.

In sum, the rate of which the oil breaks down depends on the number of different microbes in the immediate vicinity of the oil.

This in turn depends on the number of microbes and they depend on the temperature optimum between 20 and 30 degrees and the

availability of oxygen and nutrients, such as nitrogen, and phosphorus compounds.

Oil which sinks and is silted over is deprived almost completely of oxygen, so it breaks down extremely slowly. On the other hand, oil dispersed in droplets within the upper layers of water is exposed to warmer conditions and a replenishable supply of oxygen and nutrients.

Accordingly, it is argued that dispersing a slick with chemical additives will promote the oil to the water surface ratio and speed up the overall process of biodegradation.

Conversely, thick water in the oil emulsion or chocolate mousses which sink to cooler water where there is less available oxygen and reduced oil to water surface area ratio are less likely to degrade.\*6

#### III.1.2.4. OXIDIZATION.

The chemical interaction of hydrocarbons with oxygen called oxidization, is another weathering process, but it is a slow one.

Oxidization is believed to occur at the water surface where there is an abundance of atmospheric oxygen, especially when the slick is very thin.

Ultra-violet light can act as an agent or

catalyst, hence the term photo oxidation. The intermediate hydrocarbon product broken down by photo oxidation may be more digestable to microbes, may themselves promote emulsification or may be soluble in sea water.

#### IV.2.OIL POLLUTION EFFECTS ON FISH AND SHELLFISH POPULATION ON FISHERY.

Having briefly reviewed the theory of fishing, we are in a position to consider the effect of oil pollution petroleum dispersants etc on fish and shellfish populations.-

It will be clear that the toxic effects on the eggs and larvae of fish and shellfish which are not in a stock are likely to affect recruitment only if the mortality is massive in scale. This will demand that the oil spill was very large and that a substantial proportion of the toxic components of the oil had not evaporated but were dissolved in the water and the eggs and larvae were concentrated in the area of the spill.\*7

Scientists are in agreement that oil floating on the open sea is rarely a hazard to fish and shellfish stock. The chances of spilled petroleum offering a threat to recruitment is very small.-

The greatest danger lies in petroleum spilled directly into shallow shore waters. The latter include important nursery grounds for flatfish such as plaice and turbot.

The extent of the effect would depend on the extent to which toxic component were dispersed in the water, the size of the area of the species and the size of the spill

One of the few cases where spilled oil was shown to kill large numbers of fish was at Buzzards Bay, Massachusetts in 1968. The oil was highly toxic light fuel spilt directly into turbulent shallow water. Another case was the Amoco Cadiz oil spill in March 1978. This ship was wrecked on the Brittany coast and lost its entire cargo of 100,000 tons of light Arabian and 123,000 tons of Iranian crude oil over a period of some two weeks.-

Rough seas dispersed the oil in the sub-littoral zone and dead fish were seen for some 10 kilometres around the wreck.\*8

#### IV.3. IMPACT ON THE TOURISM INDUSTRY.

The tourism industry can be damaged by oil pollution. Pollution when causing damages to beaches impair such activities as connected to tourism.

Let us take for example people in the United States of America and Canada where seven people out of 12 have their own pleasure boats. Their activities during their holidays and spare time are mostly spent at the beach.

If this beach polluted it will cause social problems as well because people who want to spend their vacation at the beach will be forced to stay at home. Moreover those who rely on tourist activities such as local government will face less earnings, because nobody will visit the beaches but go to other places.

#### IV.4. IMPACT ON MANGROVES.

Mangroves are trees or bushes growing up to the extreme high water mark on sheltered shores and in estuaries throughout the tropics reaching their greatest luxuriance in part of Sout East Asia.\*9

There is a zone in which mangroves and salt marshes can be found growing together. Such areas include the gulf coast of the USA, southern Australia and southern Japan.

Mangroves are of direct commercial importance in the production of timber firewood charcoal and bark for tanning.

They are the feeding and breeding grounds for a variety of fish, crustaceans and molluses and the trunks and poop roots usually support a varied fauna of oysters, snails, barnacles, crabs and other invertebraes.

Mangroves leaves are an important source of the detritus upon which many marine food chain are based. Mangroves have by trapping and stabilising sediment, increased land area over the centuries and also protected nearshore corals from being overwhelmed with sediment.-

Some idea of the accretion on mangrove coasts is given by the fact that when Palembang in South Eastern Sumatera was visited by Marcopolo in 1292 it was still a coastal or rivermouth port.\*10

But now it is 50 kilometers inland. An overall impression is that severe oil spills and the acute short term effects are likely to cause trapping of oil, high mortality of invertebrates, depoliation of mangroves and death of seedlings.

In 1977 A group of scientiest .initiated a post oil survey in Indonesia to measure the effect of oil on mangroves two years afer the accident which happened on January 1975, when the Showa Maru M/s en route for Japan with cargo of Arabian light grounded near buffalo rock(Karang banteng).

It is estimated that approximately 54.000 barrels of oil were spilled. The result of that post oil survey was that, the occurence dead and damaged mangroves were associated with comparatively high petroleum hydrocarbons residues in the sediment.\*11

There was some evidences that relatively undegraded hydrocarbons occurred below the surface ; the fact that dead mangroves occur in pockets suggests that they were killed by standing of slicks.

#### IV.5. IMPACT ON BENTHIC ENVIRONMENT.

The benthic ecosystem is very sensitive to the immediate effects of oil slicks because it consists of a large number of fixed organisms which are immediately affected.

Recovery of species is gradually happening again and again. This is function of the capacities of reproduction of species of the degradation of oil slicks.



## IV.6.EFFECTS OF HYDROCARBONS ON ZOOPLANKTON,PHYTOPLANKTON AND ON BACTERIA.\*12

### IV.6.1.EFFECTS ON ZOOPLANKTON.

Zooplankton species are very sensitive to petroleum and quickly contaminated.The effect can be decreased of biomass and important mortality in the short term and in the medium term there is absence of reproduction,perturbation of feeding behaviour and modification of the nutritions environment. In the long term effect species generation will be terribly contaminated.

### IV.6.2.EFFECTS ON PHYTOPLANKTON.

Hydrocarbons damage the abiotic factors , which rely on the survival of the species.The phytoplankton is the first link of the tropic chain and it contributes to a large extent to the feeding of herbivors.

### IV.6.3.EFFECTS ON BACTERIA.

Bacteria contribute to the destruction of organic matters whose oxydation is neccessary for the recurrence of nutritional salts used by phytoplankton.

As a matter of fact hydrocarbons in marine ecology contribute to the construction of the

germs heterotrophe because their foods are  
carbons.

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## CHAPTER.V

### MEASURES TO COMBAT AND CONTROL MARINE POLLUTION

#### V.1.CONTINGENCY PLAN.

Every area in the neighbourhood of an oil installation and also where tankers regularly pass along the strait or the shore line should have a contingency plan. It will be much better and highly appreciated, that this means almost in every sea coast in the world but at least it is emphasized that those contingency plans must be local.

They must be drawn up by local people who have an accurate and intimate knowledge of all details of the areas and every aspect of the problem.-

However ,these contingency plans have a considerable similarity and there are a number of basic facts which must be considered and included. First,what the risk is of an oil spill.

This must be determined by examining of the amount of oil which is moved into or out of the area and the amount of oil which is carried close to the shore concerned, i.e the number and the size of the tankers. The past record of the area of oil spill,will be most helpful in this respect.The next point to consider is the maximum size which would be the size of the largest tanker that could possibly traverse the area.

It is rather,what is the best estimate that can be made of the largest spill that is likely to occur. If the oil

forms a well, then what is the maximum rate of discharge assuming that the control devices were inoperable and how long would it be before the flow could be checked or stopped altogether?. In the case of a tanker, what are the size of tankers which most commonly pass through the area?.

What is the likelihood of a collision between tankers or between a tanker and another vessels? What are the weather conditions?. If a tanker ground, will it be on rock or on sand. Is the vessel likely to break up or be dragged off unharmed.

Careful consideration of these factors, together with a scrutiny of past records, both in the particular place and in the similar situations throughout the world, will enable the estimate to be made of the maximum probable size of spill.

It is essential to try to do this exercise and to produce a figure, because if an organisation is to be set up, it must have a target. It must be able to deal with so many thousand tons of oil in so many days. If the spill is smaller than anticipated then obviously the clean up will be quicker and more effective.

If the spill is larger, then either the clean up will take longer or, alternatively additional equipment will have to be obtained from other places, flown in or brought in by sea.

The next point to be considered is why the oil must be cleaned up, i.e what the risk is and what would be damaged if nothing was done. In many circumstances, there is much

merit in doing nothing to the oil but leaving it to nature to remove. Nevertheless, there also many conditions in which some action must be taken.

If the oil threatens amenities, when they are actually being used, or just about to be used, then obviously it must be removed. Similarly if the oil is threatening a sea bird area, when the birds are actually present or just before they are due to arrive then again the oil must be clean up.

But it will be a very big problem if the oil reaches the beaches on a fairly remote coastal area largely used by holiday makers. It must then be cleaned up as soon as possible.

In dealing with the shore clean up problem in particular it is essential that advice is taken from all of the scientist who are concerned with wildlife in that area; such as the Ministry of Agricultural, Fisheries and Food.

From the advice received from those various bodies, a map can be prepared of the coast line on which various areas of particular interest will be marked. It birds nesting there or shellfish beds. Having marked these areas a clean up strategy can be developed.\*1

Some areas may have to be cleaned immediately, whatever the time of the year.

Other areas perhaps should never be cleaned at all because of the potential danger due to the fact that cleaning, or even men walking or driving vehicles on the

freeshore is too great to be permitted. In some areas dispersants ,even low toxicity varieties should not be used. In other areas it is essential to get the beach clean no matter by what method. All these discussions and the drawing up of these contingency plans must be done before the oil arrives. It can not be left until the threat of pollution is imminent because incurable mistakes will then be made, the cost of clean up will be increased and the potential danger to the wildlife is almost certain to be greater and greater.

When all these considerations have been taken into account then it will be possible to determine how much equipment is required to fulfill the requirements.

This can be divided into; Equipment to keep the oil away from the coast, for example booms, or chemical herder and equipment to contain and pick up the oil. Earth moving is a type of equipment to remove dirty substances after the oil has reached the beaches.

Hand held and other types of dispersant equipment pumps, sea water hoses, and other equipment. Stock of expendable material must be purchased and stored.

Above all, an organisation must be set up to deal with the spill, men must be appointed and well trained to use the equipment .It is essential that if oil is spilt, all of the contingency arrangements move into action smoothly and rapidly where time is the essence of the whole operation.

In setting up an oil pollution contingency plan to cover the shore-line of an entire state, it is essential that

all the various units can be centrally controlled and coordinated ,so that in the event of a major incident,all of the resources can be utilized to the best advantage.

According to the IMO symposium on marine environment at Acapulco in 1976 regarding clean up operations,oil spills can be divided into three groups.\*2

1.Chronic pollution.

Which in this context can be described as the tarry lumps and occasional patches of viscous semi liquids oil found on almost all coasts and particularly on wind ward ocean shores.

2.Medium spills.

Which are mostly produced by ships during handling of their bunkers and/or cargo almost always occur during transfer operations. These spills by their very nature are usually small and constitute 97% of all spills from tankers.

3.Large spills.

Can result from a major incident involving a tanker. Although this type of spill is infrequent and accounts for only 3 % of all spills, they are the ones that can cause serious pollution. In two thirds of these incidents more than 50 barrels of oil entered the sea.



Combating pollution requires planning at these three levels to be complementary and , as the size of the spillage increases the need for co-operation between levels at national and international level becomes essential. Oil knows no boundaries and the plan must satisfy the basic requirements for the rapid controlled and coordinated reaction from properly trained men using the right equipment. In formulating the plan , it is essential to ensure that the clean up of each an every spill,whatever its size is efficient,i.e clean up with the least damage to the environment and the least cost.\*3

The contingency plan will have to be written or approved by the responsible authority for the country or areas concerned. It may well be divided into several parts, but the following fundamental points, will have to be fulfilled by each and every part.

1. The plan must be clear, simple and include the details of a chain of responsibilities.
2. At all three levels there must be an immediate and effective response. The men, equipment and materials must be available at the scene pollution.
3. Logistic support and reinforcement must be readily available .
4. The men at the scene in charge of operations must be able to devote all their energy to the clean up task. The coordination provision, supply and reinforcement of men and materials and all other related

responsibilities must be carried out by others.

Oil spills occurring mainly in harbours, will be dealt with by a harbour clean up operations, including both boat and shore parties. Warning of oil pollution can be seen to come from either local reports or higher level authorities.\*4

The increased threat from this size of spills requires more comprehensive planning and clean up capability. The organisation can either be responsible for the local port authority or the oil industry.

Contingency plans should recognise that the best way to limit the spread and adverse impact of oil spills is to provide for response by thoroughly trained crews and supervisory personnel. Contingency plans include;\*5

1. A list of persons and agencies that must immediately receive the report of an oil spill.
2. A list of jobs in order of priority that must be taken when oil is spilled.
3. The designation of authority identification of a chain of command and the assignment of qualified personnel to specific oil spill response tasks.
4. A communications network to assure co-ordination of efforts and efficient response.

5. Reference materials such as sensitivity maps and other technical data that will be useful to those persons responsible for action.
6. Data which identify probable oil movement patterns under a range of climatic conditions.
7. An inventory of the type and location of all available oil spill response equipment.

The aboved mentioned should be borne in mind that whilst an effective administration has been established the threat of pollution still exists, therefore a contingency plans whose aim is to provide a timely and adequate response when pollution incidents occur so as to minimize damage to the environment has to be elaborated.

## V.2. CONTAINMENT, RECOVERY AND RESTORATION.

### V.2.1. CONTAINMENT.

Containment of an oil spills is the process of prevention .Its spread by confining the oil to the area in which it has been discharged. The purpose of the containment is not only to localize the spill but to minimize pollution as well but also to facilitate removal of oil by causing it to concentrate in thicker layers on the surface.\*6 .

Containment booms ar an essential tool in any oil clean up program and are generally the first equipment mobilized at the scene of a spill and

the last to be removed. A number of devices have been designed to limit the spread of oil on water and each has its own advantages and disadvantages depending on the conditions under which it is used. A perfect oil containment device simply does not exist and it is up to those persons responsible for development of effective contingency plans to select the devices which will be most suitable for potential spills in a given area.

Many different types of oil retention barriers have been developed to prevent the spread of oil slicks, these include commercially available floating booms, sorbent barriers, air and water streams air or bubble barriers and chemical barriers. Commercial floating booms are the most commonly developed containment barriers.

A floating boom is a mechanical barrier which extends above and below the water surface and is designed to stop or divert the flow of oil. Booms are generally used in one of the three ways;

1. To close oil slicks, thus reducing the spreading rate allowing build up of the oil into a layer of sufficient thickness to facilitate recovery.
2. To protect specific areas, such as entrances to harbour rivers, and regions known or expected to contain biologically important or sensitive

resources.

3. To divert the oil to areas where recovery is possible.

Floating booms resemble a vertical curtain with portions extending above and below the water surface, and all are designed to follow wave motions so that the lowest portion never rises above the bottom of the slick and the up most portion never falls below the top of the slick.

But the success of this principle of operation is highly dependent on conditions in the area where the boom is deployed and any boom will fail to contain oil under sufficiently adverse conditions.

The structure of the floating booms have four components; a means of flotation, a free board to prevent oil from washing oil over the top, a skirt to prevent oil from being swept, underneath and a longitudinal support member to allow the boom to withstand the forces of winds, waves and currents.

Some booms have weights to keep the boom on the water surface. Flotation material used in booms include expanded plastic foams such as polyethylene, natural floatation materials such as wood or cork and gases such as air or carbon dioxide.

The skirt of a boom or in some designs skirt and float provides the basic barrier to the spread of oil. Skirt depth also affects the efficiency of the boom in preventing the escape of oil.

As I mentioned before, the boom has a specific design; However it can fail because a boom performance is greatly affected by wind, waves and currents. These forces often lead to boom failure and potential loss of oil.

Oil loss resulting from boom failure may be attributed to one or more of the following causes; Underflow caused by currents; -Splash

- over caused by wind or waves
- Mechanical failure of structural members or joints between successive boom sections
- Improper positioning of the boom with respect to current direction.

The most common type of boom failure is due to the fact that a boom placed in moving water tends to act as a dam. The surface water being held back by the dam is diverted downwards and accelerates in an attempt to keep up with the water flowing directly under the boom skirt.

As a general rule oil will begin to escape beneath the skirt of most booms when current velocity exceeds 36 cm/sec (0,7 knots). However that type of boom failure can be overcome to a certain extent by placing the barrier at an angle to the current.

Winds is a secondary factor affecting the efficiency of containment boom when the current is the dominant but the primary factor in the absence of the currents. Unless the boom is securely anchored from both sides, a strong gasting wind opposing the direction of the current will often cause the barrier to alternate by moving back and forth over the water surface.

This action may result in considerable oil loss due to spallsh over .When winds and current are moving in the direction their effect on the boom is additive. Wayes also affect the efficiency of floating booms.

Most booms perform well when waves are in the form of a gentle swell with a length to height ratio. Another type of equipment is improvised booms and barriers which can be used to contain relatively small spills which occur in sheltered waters or as a temporary measure untill more suitable commercial booms arrive at the spill site. Various types of barriers may be constructed to contain oil spills in streams or ditchers too shallow conventio-  
nal booms.

V.2.1.1.Sorbent booms and barriers are specialized containment devices which absorb the moving oil slick in various material such as straw or one of many syntetic product ,effectively combaining containment and recovery operations.

However sorbent booms and barriers are only used when the oil slick is relatively thin since its recovery efficien-  
cy rapidly decreases once the porous surface is saturated with oil. Sorbent booms can take a variety of forms such as batts or sleeves which can be placed in narrow streams or other confined areas where oil is moving.

Boom constructed of sorbent material,require considerable additional support to avoid breakage under the force of water and also afterwards require some methods of oil pollution to prevent sinking when saturasted with oil and water. When removing the boom,care must be taken so that

oil is not squeezed back into the water. In some situations where the water is shallow and the oil slick is thin, sorbent barriers may be more practical and efficient than sorbent booms.

Bubble barriers can be produced when air is pumped into a perforated pipe located below the water surface. This rising curtain entrains water which spreads horizontally in the two directions perpendicular to the submerged pipe when it reaches the surface. The bubble or air curtain system is most suited to relatively calm harbour.

#### V.2.1.2. Chemical barriers.

Certain chemicals act as surface tension modifiers and inhibit the spread of oil. When relatively small quantities of those chemicals are placed on the water surface next to the floating oil, the oil is pushed away as a result of the stronger spreading force of the chemical. Chemical barriers can be used to divert an oil slick to recovery areas.

However, chemical barriers act only on fresh oil and their effect last only a few hours; consequently recovery of the oil must begin immediately after application.

As with any chemical, approval for the use of a surface tension modifier must be obtained from the appropriate government regulatory agencies. Chemical barriers are less effective with viscous oils and are generally unsatisfactory in icy or cold waters or areas where winds currents or wave action are significant.



### V.2.2.RECOVERY.

Following containment of an oil spill, the next step in the clean up operation is recovery of the oil from the water surface. In the previous clarification, it was emphasized that one of the major objectives of containment is to concentrate oil into thick layer to facilitate recovery.\*7

There are three distinct approaches to the physical recovery of oil from water are the use of mechanical skimmers, the use of sorbents and manual removal by the clean-up work force.

#### V.2.2.1. SKIMMERS

A skimmer can be defined as any mechanical device designed to remove oil from the water surface without causing major alterations in its physical or chemical properties. Skimmers vary tremendously in both recovery efficiency and capacity. It also takes variety of forms including those designed to operate from one position, mobile device, those requiring currents to carry oil to the device when it is stationary. The effectiveness of any skimmers depends on a number of factors including the type of oil spilled, the thickness of the slick, the presence of debris in the oil water and the location of the spill.

#### V.2.2.2.WEIR SKIMMERS.

This type of skimmer takes advantages of gravity to drain the oil off the water surface. These devices in their simple forms consist of a weir or dam, a holding tank and

an attachment which is connected to external pumping equipment. Weir skimmers can operate with a variety of external pumps and have been successfully used to recover a range of flow viscosity oils.

The efficiency of weir devices is drastically reduced in cold waters where some of the oil are below their pour point and will not flow. Another problem with this equipment inherent to the design of weir skimmers is their tendency to draw too much water relative to the quantity of the oil recovered.

Consequently ,pumping rates must be adjusted to maintain the highest possible oil to the total liquid recovery ratio. Weir skimmers are most satisfactorily used in calm perfected waters,such as some harbours ,lakes,ditches and to a lesser extent,rivers,.They are rarely used in the open sea.

#### V.2.2.3.SUCTION SKIMMERS.

Suction skimmers are similar in many cases to weir type devices and tend to be susceptible to problem of the same nature. These skimmers also sit on the water surface, generally use on external vacuum pump system and are adjusted to float at the oil water interface.-

But due to its compactness and shallow draft suction skimmers are particularly useful in shallow water and in confined areas,such as under dock. Suction skimmers are most effective in calms water when containment barriers are used to direct the flow of oil toward the floating head.

#### V.2.2.4.CENTRIFUGAL SKIMMERS.

This skimmer design operates by the creation of a water vortex or whirlpool,which draws the oil into a collection area. The oil is subsequently pumped from this area to an oil water separator for recovery.

#### V.2.2.5.SUBMERSION SKIMMERS.

This type of skimmer is usually large in comparison to the devices previously described and it is typically mounted on or incorporated within a powered vessel. Oil in the path of the skimmer is forced beneath the water surface.

This belt forces the oil downward toward the mouth of the collection wall where it rises to the surface due to its buoyancy. Water collected with the oil simply passes under the collection well. Oil adhering to the belt is removed by a mechanical scraping device located at the collection wall opening or within the well itself and is then pumped to an on board or adjacent storage facility.

#### V.2.2.6.SORBENT SURFACE SKIMMERS.

This type of skimmer incorporates a surface to which oil can adhere in order to facilitate its recovery from the water.The sorbent surface can be in the form of a drum ,disc,belt and rope which is continuously moved through the oil film .Oil collected on each of these surfaces is removed by a wiper blade or pressure roller and is subsequently deposited into an onboard container or pumped to storage facilities on aboard or the shore.

#### V.2.2.7.SORBENT.

The second major approach for recovery of spilled oil is the use of sorbents. Sorbents are defined as any material which will recover oil thorough either absorption or adsorbtion. Absorption occurs when one substance ,in this case oil penetrates into the interior of another and adsorption occurs when one substance is attracted to and adheres to the surface of another.

Generally this material does not play a primary role in oil spill clean up operation but is mostly used for final cleanup of trace amount of oil or to remove oil from areas which are inaccessible to skimmers. There are three basic classes of sorbents, as folows;

- Natural organic materials such as peat moss, straw hay and sawdust.
- Mineral based materials, such as vermiculite perlite and volcanic ash.
- Syntetic organic sorbents, such as rubber polyster foam, polystyrene and polyurethane.

It is also important that the sorbent materials retain the oil when it is lifted off the water. Some materials which rapidly absorb oil also allow it to readily drain out again.

#### V.2.2.8.MANUAL RECOVERY.

Manual recovery of oil with buckets,shovels and similar equipment remains a commonly used technique.This approach is frequently taken for small spills which occur in ports and rivers and continues to play a role in virtually all spills which occur near populated areas.Viscous oil is readily removed by manual methods than lighter oils which almost invariably require the use of a sorbent for complete recovery. Available manpower and disposal facilities are the limiting factors in manual recovery.

#### V.2.2.9.SEPARATION AND DISPOSAL METHOD.

The two major tasks following the recovery of oil spilled on the water are to separate the oil from water and to dispose this oil together with any removing sorbent materials.No separation and skimmers or sorbent material is 100% efficient,so all oil recovery processes produce some mixture of oil and water.The oil must be separated from this mixture for ultimate disposal or re-use by the petroleum industry.

Oil seperation devices are often incorporated in skimmers in the form of settling tanks or gravity separators. In skimmers of this type,separated oil is transfered to barrels or temporary holding tanks until it can be pumped to shore facilities.

#### V.2.2.10.DISPOSAL.

Persons responsible for an oil spill clean up follow guidlines and regulations for disposal of oil and debris

which are established by local or central environmental agencies. Disposal is one of the most difficult problems associated with the clean up of oil spills. In many cases the volume of oil fouled debris may equal that of the total oil recovered.

Incineration is another method of disposing of recovered oil. Incineration of recovered oil should be distinguished from the actual burning of oil slick on the water surface, or the in situ burning of an oil which is stranded on the shoreline. In the case of incineration the oil is actually recovered and then transported to another site for disposal. The main advantage of the incineration is its speed and the fact that large quantities of oil can be disposed of at low cost.

Burning may produce unacceptable levels of air pollution, destroy plants and animals and leave an unsightly tarry residue; besides disposal technique invariably kills the micro-organisms necessary for the biodegradation of any residues.

#### V.2.2.11. TREATMENT OF SPILLED OIL.

There are an assortment of chemical agents which can be added to oil to facilitate its clean up or removal from the outset. The use of chemicals in oil spill clean up devices is not only officially discouraged in most cases but for many interests it is prohibited and may only be considered after all other means fail.

Generally speaking chemicals are only used in oil spill clean up when the potential damage to biological and

physical resources could be greater if they were not used. There are six chemical treatments as follows;

#### V.2.2.12.DISPERSANT.

Dispersants contain chemicals which reduce the surface tension between oil and water and therefore result in the break up and dispersal of the slick throughout the water column in the form of an oil-in-water emulsion. The use of chemical dispersants to increase dispersal of an oil slick is analogous to the use of common household soaps to facilitate removal of dirt adhering to the fibres of clothing.\*8

Dispersants are generally most effective when applied to unweathered oil slicks in relatively warm water and must normally be applied in a ratio of about one part dispersant to 5 to 10 parts of oil depending on the type and the viscosity of the oil, the efficiency of the dispersant and the availability of mixing energy. Government should prohibit the use of dispersants in any waters containing major fish populations or in the breeding or migration areas of fish and other aquatic life which may be damaged or rendered less to the commercial market by exposure to dispersants or chemically dispersed oil.

Dispersant use is particularly not permitted in coastal areas and is generally avoided once oil has been deposited on sandy beaches or on shoreline with important flora and fauna.

#### V.2.2.14.SINKING AGENTS.

Special materials can be spread on the oil slick and oil

will be absorbed to their surface. The combination of oil and sinking agents is heavier than water and therefore sinks. Common sinking agents include treated sand, brick dust, cement, silicone, treated materials, fly ash, chalk and special types of clay. Like dispersants, sinking agents may cause considerable damage to bottom dwelling organisms and their use is generally prohibited.

The displacement of oil from the surface to the bottom may also adversely affect ground fish communities, contaminate bottom fishing gear and decrease the rate of microbial degradation.

#### V.2.2.15. CHEMICAL BARRIERS.

This chemical can be used to concentrate the oil slick in to thicker layers to facilitate recovery or to deflect oil from sensitive areas.

#### V.2.2.16. BURNING AND SINKING AGENTS.

Burning is another way of disposing of oil on water. However despite the fact that many hydrocarbons are flammable. This is often difficult because the fire must be kept hot enough to continually support combustion and must be supplied with sufficient oxygen. Burning agents are compounds used to ignite and sustain the combustion of spilled oil, whereas wicking agents increase oxygen availability and insulate the the burning oil from the water. In some remote or offshore areas burning may be considered a satisfactory method for disposal of an oil slick. However the possibility of unacceptable air pollution and safety consideration often prohibits this



approach in inland waters. As oil weathers, volatile and lower flash point components are rapidly lost through evaporation.

#### V.2.2.17. GELLING AGENTS.

Gelling agents are chemicals which increase the viscosity of the oil slick and thereby reduce its rate of spread over the water surface. Some gelling agents change oil into a cellular like foam while others actually coat the oil with a material having the consistency of plastic thread. This chemical is rarely used because the price is relatively expensive and it takes at least eight hours before the gell is sufficiently strong to allow recovery and subsequent disposal of oil.

#### V.2.2.18. BIOLOGICAL AGENTS.

This technique has been successfully used in the warm waters of the Gulf of Arabia. It has been emphasized that its process is extremely slow and limited to a large extent by temperature, available nutrients and dissolved oxygen concentration in surrounding waters.

### V.2.3. SHORELINE CLEAN UP AND RESTORATION

It is rare when oil spilled on water can be completely contained and recovered before some of it reaches the shoreline. Clean up of shoreline areas is considerably more difficult and time consuming than containment and recovery operations on water.

It should be emphasized that the physical removal of oil from some types of shorelines may result in ecological or physical damages far in excess of that which could occur if oil removal were left to natural processes. The decision to initiate clean up and restoration activities on oil contaminated shore areas is based on careful evaluations of socioeconomic aesthetic and ecological factors.

When oil has polluted beaches in a populated region or areas of recreational use, priorities and pressures for cleanup differ from those which may be directed toward removal of oil by natural processes which may be unacceptable and clean up action may be required despite its possible ecological implications.

The decision to clean a shoreline also includes consideration of the probable natural rates of dispersion and degradation of oil under the local climatic conditions, as well as the geological and ecological sensitivity of the contaminated shoreline area. Finally the decision to clean and restore shorelines depend on the effectiveness of the available clean-up equipment and technology in relation to the steepness and composition (sand, cobble, rock) of the affected areas. For example the removal of oil from flat sand beaches clearly poses a different set

of problems than clean up operations on steep, rock shores where oil can easily become trapped in small devices.

#### V.2.3.1. SHORELINE SENSITIVITY.

Shoreline sensitivity is defined as the potential for adverse environmental effects resulting from alteration of normal physical and biological shoreline processes, either by the presence of oil or the activities involved in clean up and restoration programs. The impact both oil and oil clean up operations is greatest in the most biologically productive environments.-

The impact of oil on marshes can vary tremendously depending on the season, the type, volume and distribution of oil as well as with the clean-up technique employed.

#### V.2.3.2. BEHAVIOUR OF OIL IN SHORELINE.

When oil reaches the shoreline, the type and the extent of contamination is determined by a multitude of factors, including the type of oil, the total volume of oil, the length of the time the oil has been in the water (i.e. degree of weathering, the temperature, the time of which the oil washes up on the beaches and the type of the beach substrate (material composition)).\*9

Some oil which has been on the water for a length of time maybe deposited as tar-balls, while others may reach the shore in the form of highly viscous slicks. Some shoreline types naturally clean themselves through the process of degradation, abrasion and dispersion. This natural clean up capability depends on a number of factors but is pri-

marily related to the amount of wave energy reaching the shore.

#### V.2.3.3. BIODEGRADATION BY BACTERIA AND OTHER MICROBIAL ORGANISM

Biodegradation and other microbial organisms, are influenced by oxygen availability, temperature and surface area of oil available for attack. In open coastal environments where wave action is relatively heavy and the shore is predominantly rocky - natural dispersion and degradation may remove the bulk of the stranded oil in a few weeks. Conversely, sheltered coastline areas, particularly those characterised by sand substrate may retain stranded oil for years. This is the case in Chedabucto Bay, Nova Scotia Canada, where oil still persisted in some beach areas, eight years after the grounding of tanker Arrow in 1970.

#### V.2.3.4. SHORELINE PROTECTION METHODS.

The only way to prevent damage to shoreline areas resulting from spilled oil and clean up activities is to prevent the oil from reaching the shore in the first place. However it is virtually impossible to protect all shore-line areas from oil contamination and priorities are assigned to protect those areas considered most sensitive.

Since sheltered coastal environment, marshes and lagoons are most sensitive to damage by oil and usually difficult to restore, protection of these areas is given highest

priority.-

The favoured approach is to deploy containment booms and skimmers at the site of the spill, before the oil threatens sensitive beach areas. In a situation, where a shoreline area is considered particularly sensitive to oil it may be necessary to consider the possible use of dispersants, before the oil reaches the coastal environment.

#### V.2.3.5. SHORELINE RESTORATION.

The most acceptable methods for the clean-up of stranded oil in a shoreline environment and subsequent restoration of the areas depend on the type of shoreline and the nature of its biological resources. The presence of man made structures, such as jetties, piers, and docks require specialized clean-up techniques when excessively contaminated.

Therefore most of the methods for shoreline clean up and restoration activities are common to many shoreline clean-up programs and restoration are applicable to more than one beach type.

#### CHEMICAL AND HYDRULIC DISPERSION.

Non-toxic or low toxicity chemical dispersants can play a role in shoreline clean up when permission is obtained for their use and the shoreline is not biologically sensitive.

Dispersants can be sprayed on rock surfaces but are not normally used on sand because they accelerate penetration of stranded oil into substrate and may create conditions

similar to quicksand. Dispersants are sprayed on contaminated areas at low tide and as the tide rises natural wave action mixes the chemical with the stranded oil to form an oil-in-water emulsion. This emulsion is subsequently flushed from the contaminated beach area with water hoses or through natural wave action.\*10

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## CHAPTER.VI

### INTERNATIONAL,NATIONAL AND INTERDEPARTMENTAL CO-ORDINATION

#### VI.1. INTERNATIONAL ORGANISATIONS.

Marine pollution is primarily an international problem; the main international organisations involved in marine pollution by oil can be listed as follows;

- IMO :International Organisation.
- UNEP :United Nations Environment Programme. -
  
- IOPC FUND :International Oil Pollution Compensation Fund.
- P.I.Club :Protection and Indemnity.
- OCIMF :Oil Companies International Marine Forum
- IPIECA :International Petroleum Industry Environmental Conservation Association.
- ITOPF :International Tank Owners Pollution Federations limited.
- IACS :International Association of Classification Societies.
  
- OCIFMPC :Oil Companies for Marine Pollution Compensation Limited Cristal.
- E.P.Forum :Oil Industry International Exploration and Production Forum.
- IADC :International Association of Drilling Contractors.
- OPOL :Offshore Pollution Liability Association Limited.



- ICS :International Chamber of Shipping.
- INTERTANKO:International Association of Independent Tanker Owners.

#### VI.1.1.IMO(INTERNATIONAL MARITIME ORGANISATION)

Taking into account the fact that IMO is the main organisation dealing with pollution from ships;it is important to focus the attention on IMO in more details.

After World War.II,the United Nations recognized the need to create a specialized agency to deal solely with maritime matters.Accordingly,the United Nations Maritime conference was convened in Geneva( Switzerland) in 1948 and concluded the convention on the Inter-governmental Maritime Consultative Organisation (IMCO) now called IMO. This convention come into force in 1958 and IMCO come into being at the time. Since its modest start with 21 members states IMO has steadily grown and its members at present 1988 total 129 states together with one associated member.IMO is therefore a universal Maritime Organisation with its membership comprising all nations interested in shipping. The objectives of IMO a provided for in article of its convention are,inter alia,to provide machinery for cooperation among governments in the field of governmental regulations and practices relating to technical matters of all kinds affecting shipping engaged in international trade to encourage the general adoption of the highest practical standards in matters concerning maritime safety and efficiency of navigation and the prevention and control of marine pollution from ships and to deal with legal matters related thereto. In the field of maritime environment protection,prevention control and abatement of marine

pollution the work programme of IMO is directed towards the following;

- To promote national and regional arrangements for combating pollution.
- To develop and implement technical assistance programmes to facilitate the implementation of conventions.
- To minimize pollution arising from maritime accidents by adopting standards for construction equipment, navigation al, cargo handling and crew qualifications.
- To mitigate the effects of pollution once it occurs, by adopting certain ship construction and operation requirements and by adopting an international legal regime for intervention in the event of emergencies.
- To develop and adopt the highest practicable standard for the and control of deliberate and accidental pollution from ships and other equipment operating in the marine environment.
- To establish schemes whereby victims of pollution are compensated for the financial loss.
- To prohibit the deliberate discharge of oil and other harmful substances into the sea by regulating ship operations such as tank cleaning and deballasting and also by adopting standards for design, construction and equipment of ships.
- To develop procedures and encourage governments in the effective implementation of conventions, including survey and certification of ships ,port state control and sanctions against discharges in contravention of conventions requirements.

IMO works in close association with other shipping and oil industries and in co-operation with other organisa-

tion of the United Nations family.

The work relating to prevention and control of marine pollution normally culminates in the formulation of international conventions and similar multilateral instruments, codes and practices recommendations to governments and other guidelines and manuals.

Since 1959 IMO has adopted nearly 30 treaties or other instruments covering many aspects of marine safety and pollution prevention including such matters as the safety of life at sea, collisions avoidance, measures to prevent pollution by oil and other substances, compensation for oil pollution damage, the right of states to prevent pollution, crew standards and so on. The principal organ of IMO have since its inauguration the Assembly, the Council and Maritime Safety Committee; there are now five specialized committees;

- Maritime Safety Committee
- Legal Committee
- Facilitation committee
- Technical cooperation Committee
- Marine Environment Protection Committee

The committees activities are largely concerned with implementing the resolutions and dealing with the technical problems associated with the entry into force of the marine pollution convention.

The role of IMO in assisting developing countries. One of the principal functions of IMO is to provide technical assistance to developing countries. In the field of marine environment protection, technical assistance

programmes cover such areas as; advisory services, fellowships, seminars, workshop, and training course, meeting of government experts, preparation of manuals and training materials.

Advance on the capacity and type of reception facilities for oily wastes required for the implementation of pollution conventions, advice on the types and quantities of oil combating equipment and material, and the use of chemical dispersant and preparation of contingency plans.

An advisor on marine pollution works at IMO headquarters (London) a regional adviser for Latin America stationed in Santiago and regional consultant on marine pollution for central America is stationed in Panama. All this advisory services are normally undertaken by inter-regional advisors and consultants.

#### VI.1.2. INTERNATIONAL OIL POLLUTION COMPENSATION FUND.

The International Oil Pollution Fund came into force 1978. It is based on the 1972 fund convention. IOPCF is financed by contributions from receivers of crude oil or heavy fuel oil with the territory of the contracting states in proportion to the quantities which have been carried by sea. The fund is administered by a secretariat, an executive committee and assembly, the latter comprising representatives of all contracting states. It applies only to clearance costs and not to penetrative measures. Its principal function is to provide additional compensation for clean up and for people who have suffered from oil pollution damage where the total exceed ship owners legal liability under the civil liability convention 1969.

V.3.3. United Nations Environment Programme. The United Nations Environment Programme is under the United Nations Organisation which is concerned with the protection of the environment. In the marine field, it encourages and supports the development and the implementation of plans to prevent oil pollution. This involves promoting international and regional conventions and guidelines for assessing and monitoring the state of pollution supporting training schemes and providing focal point for the exchange of information. In the exercise of these functions UNEP works in close co-operation with other United Nations agencies and non-governmental organization.

#### VI.1.3. OIL COMPANIES INTERNATIONAL MARINE FORUM.

The oil companies International Marine Forum is an association of oil companies transporting crude oil and oil products by sea including their loading and discharging. It is essentially concerned with the safe conduct of these operations and the protection of the marine environment from pollution. It represents its membership before inter-governmental, governmental and other organizations. It sponsors and conducts important research programmes concerned with oil transport and terminals, and has made a substantial contribution to the improvement of tanker safety.

#### VI.1.4. PROTECTION AND INDEMNITY CLUBS (P&I CLUBS).

Protection and Indemnity Clubs are mutual insurance associations for shipowners. Their function is to cover their members against third party liability which they may incur in the course of their operations and which would

not be covered by ordinary hull and cargo insurance. The clubs cover almost all the world's ocean going tanker fleets. Insurance is provided for a wide range of liabilities including liability for oil pollution. The P.I. Clubs have a common pool in which they reinsure their liability, there by spreading the risk in case of a major disaster such as an oil spill.

#### VI.1.5. INTERNATIONAL PETROLEUM INDUSTRY ENVIRONMENTAL CONSERVATION ASSOCIATION (IPIECA).

The International Petroleum Industry Environmental Conservation Association is an association of oil companies and related organisations. Its function is to act as a focal point for communications and consultation between the petroleum industry and the United Nations Environment Programme and other governmental bodies on the impact of petroleum operations on the environment.

#### VI.1.6. INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES.

This is an organisation of classification societies recognized by most governments. The organization contributes and plays a major role on aspects related to safety of ships such as follows;

- a. To examine ship drawings or to check the design of ships and offshore construction which are related to the class requirements.
- b. To test material, components and ships' appliances which are going to be used.
- c. To supervise and control the performance of the construction and modification when adjusting to the class

requirements.

d.To go along on the ship's sea trial.

e.To prepare and submit the calculation sheet of the load line to the administration.

#### VI.1.7. TANKER OWNER VOLUNTARY AGREEMENT CONCERNING LIABILITY FOR OIL POLLUTION DAMAGE (TOVALOP)

TOVALOP is a voluntary agreement between tanker owners. It applies to laden or unladen tankers. TOVALOP includes bareboat charters, pollution from bunker oil of unladen tankers. TOVALOP covers pre-spill preventive measures. It is subject to strict liability.

#### VI.1.8. OIL COMPANIES INSTITUTE FOR MARINE POLLUTION COMPENSATION LIMITED CRISTAL.

The oil companies institute for marine pollution compensation administers a pollution compensation arrangement known as CRISTAL (Contract Regarding An Interim Supplement to Tanker Liability for Oil Pollution)

This a voluntary agreement among oil companies which contribute to a central fund on the basis of crude and fuel oil received by tanker. CRISTAL supplements the compensation for pollution damage available under TOVALOP, the Civil Liability and national legislation.

#### VI.1.9. INTERNATIONAL TANKER OWNERS POLLUTION FEDERATION.

The International Tanker Owners Pollution Federation is an association of tanker owners who between the themselves almost all the world's tankers. Its function is to administer TOVALOP to provide consultancy services on

contingency planning ;to provide technical advice on oil spills,to conduct post-spills surveys and to maintain a comprehensive information service on oil pollution. Its most important activity today is to provide emergency advice at the scene of oil spills. In view of its wide experience, ITOPF is recognised as a leading centre of expertise in this field.

#### VI.1.10.OFFSHORE POLLUTION LIABILITY ASSOCIATION LIMITED.

The Offshore Pollution Liability Association Limited is responsible for the administration of the offshore pollution liability agreement. This is an oil industry voluntary agreement under which operator active in exploration and production accept strict liability for pollution damages and costs of remedial measures. Parties to the agreement guarantee that in the event of individual default,claims arising from an incidentsent will be met. Originally concerned only with oil spills occurring in the United Kingdom offshore production sector it applies now to countries in North Western Europe where offshore operations take place.

#### VI.1.11.OIL INDUSTRY INTERNATIONAL EXPLORATION AND PRODUCTION.

The Oil Industry International Exploration and Production Forum is an association of oil companies having interest in offshore oil exploration and production. With a strong commitment to the protection of the environment and promotion of safety it represents its membership before inter-governmenetal,governmental and other organization on all aspects relating to exploration and drilling for crude oil and natural gas as well as their production



treatment, storage and pipelines.

#### VI.1.11. INTERNATIONAL ASSOCIATION OF DRILLING CONTRACTORS.

The International Association of Drilling Contractors is primarily concerned with the interests of the world wide drilling contractors engaged in both offshore and onshore operations. In addition to drilling contractors, it member includes oil and gas producing companies and manufactures of machinery and equipment. It makes a significant input to the work of inter-governmental, governmental and other industry organisations on drilling matters. It is concerned with the protection of the marine environment and the promotion of safety, it sponsors a number of educational programmes on the prevention of blow outs and general training of those involved in drilling fields.

#### VI.1.12. INTERNATIONAL ASSOCIATION OF INDEPENDENT TANKER OWNERS

The international Association of Independent Tanker Owners is a unique body, in that it is concerned solely with tanker and combined carriers and only independent tankers owners are eligible for membership. INTERTANKO has stressed the problem of the lack of shore reception for oily wastes, promoted further ratification of MARPOL, particularly by the oil exporting countries and ensured a fair division of liability for oil pollution compensation between cargo and shipping interests.

#### VI.1.13. INTERNATIONAL CONVENTION ON OIL LIABILITY FOR OIL POLLUTION DAMAGE ( CLC 69 )

The purpose of CLC 69 is to provide uniform international rules and procedures for determining questions of liability and providing adequate compensation to persons who suffer from damage caused by escape or discharge of oil from ships. Article 2 of the Convention provides that that convention applies exclusively to pollution damage caused in the territory including the territorial sea of a contracting state and to preventive measures taken to prevent and minimize such damage. It should be noted however that the convention also cover damage caused in the area outside the territorial sea by preventive measures designed to prevent or minimized pollution damage inside the territorial sea. The convention applies only to pollution caused by ships ;A ship is a sea going vessel actually carrying oil in bulk as cargo. Damaged caused by non persistent oil is not covered by CLC 69 therefore spills of gasoline,light diesel oil,kerosene are not construed to be within the scope of CLC,but damages caused by spills of non persistent bunker oil by a spill from a tanker during ballast voyage is not regarded as being covered.

#### V1.1.14. INTERNATIONAL CONVENTION RELATING TO INTERVENTION ON THE HIGH SEAS IN CASE OF OIL POLLUTION CASUALTIES.

The scope of the convention and protocol comprises the area of the High Seas that is the area beyond the outer limit of the territorial sea or,if and when the exclusive economic zone is generally recognized the area beyond it.

Parties may take such measures on the high seas as may

be necessary to prevent, to mitigate or eliminate grave and imminent danger to their coastline or related interests from pollution or threat of pollution of the sea by oil. The related interests include commercial fishing and tourist interests, the health of the coastal population and the conservation of living marine resources and wild life.

#### VI.1.15. INTERNATIONAL CONVENTION ON THE ESTABLISHMENT OF AN INTERNATIONAL FUND FOR COMPENSATION FOR OIL POLLUTION DAMAGE 1971.

The fund compensation is supplementary to the civil liability convention. Its main purpose is to ensure the availability of additional compensation in cases where the protection afforded by CLC 69 is inadequate. The international oil pollution fund (IOPC) is contributed to by companies in states parties to the conventions who receive crude oil and fuel oil which have been carried by sea. Further the IOPC fund relieves shipowners partly of the financial burden imposed by the civil liability convention 1969. The fund pays to a shipowner who has been held liable under CLC 69 a certain amount fixed by the fund for each ton of the ship's tonnage. But it is exonerated from its obligation to pay indemnification to the shipowner if it can prove that, as a result of the actual fault or privity of the owner the ship causing the incident did not comply with such international conventions.

#### VI.1.16. GENEVA CONVENTION ON THE HIGH SEAS 1958.

The convention requires that every contracting state has to draw up regulations to prevent pollution of the seas

by the discharges of oil from pipelines or resulting from the exploration and exploitation of the seabed and its subsoil.

#### VI.1.17. CONVENTION ON CIVIL LIABILITY FOR OIL POLLUTION DAMAGE RESULTING FROM EXPLORATION AND EXPLOITATION OF SEA BED MINERAL RESOURCES.

This convention applies to pollution damage resulting from accidents which occur beyond the coastal low water line at an installation under the jurisdiction of a controlling state. It also applies to preventive measures whenever taken to prevent or minimize such pollution damage.

#### VI.1.18. INTERNATIONAL VOLUNTARY AGREEMENTS.

When the Torrey Canyon grounded in 1967, there were no adequate international agreements concerning compensation yet. However no arrangement existed under international law to provide damage compensation to coastal states suffering from serious problems. Recognizing the lack of suitable arrangements and sensitivity wide spread concern for the environment at the time, the tanker owners and the oil industry set up voluntary schemes to compensate for clean up costs and damages incurring at future incidents.

#### VI.1.19. OFFSHORE POLLUTION LIABILITY AGREEMENT.

The development of offshore oil pollution involves the risk of spillage. Compensation regimes exist which are similar to those in the shipping industry. All offshore operators currently active on the United Kingdom of Great

Britain continental shelf are party to a voluntary compensation scheme known as the offshore pollution liability agreement under which they accept strict liability.- This agreement has now been extended to the offshore operations within the jurisdiction of Denmark, the Federal of Germany, Ireland ,the Nederlands and Norway. The offshore pollution liability agreement is administered by the offshore pollution liability association.

#### VI.1.20..CONTRACT REGARDING INTERIM SUPPLEMENT TO TANKER LIABILITY FOR OIL POLLUTION(CRISTAL)

CRISTAL was set up in 1971 and amended on 1 January 1978. It is an agreement between cargo owners. CRISTAL is a complimentary instrument to TOVALOP .It pays compensation if oil involved is owned by oil company party to cristal and if tanker involved is party to Tovalop. Cristal applies to reasonable actions taken to prevent pollution in addition to clearence caused in dealing with any pollution which arises from accidents. It is administered by the Oil Companies Institute For Marine Pollution Compensation.

#### VI.2.REGIONAL CO-OPERATION/REGIONAL APPROACH.

The Nation of South East Asia (ASEAN) has become seriously concerned with the degradation of the biological and physical environment. There is an increasing realization that development can not be sustained if the natural enviroment is damaged. The emerging environmental concerns in the region have focused on those more immediately visible and terrestrial problem ,with the notable exception of efforts to control oil pollution in marine

waters.

In terms of scientific understanding and monitoring as well as implementation of control, pollution in Southeast Asian Seas remains a research and policy frontier.\*1

According to the Convention on the Law of the Sea 1982- pollution of the marine environment means the introduction by man, directly or indirectly of substances or energy into the marine environment (including estuaries) which results or likely to result in such deleterious effects as harm to living resources and marine life, hazard to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for the use of the water and reduction of amenities. Further, the convention says that "states shall take, individually or jointly as appropriate, all measures consistent with the convention that are necessary to prevent, to reduce and control pollution of the marine environment from any sources, using for this purpose the best practicable means at their disposal and in accordance with their capabilities and they shall endeavour to harmonize their policies in this connection". Also "states shall take all measures necessary to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with this convention".\*2

With the extension of the jurisdiction, national responsibility for environment protection extends out to 200 nautical miles from shore. Thus the Southeast Asian Seas could become a collage of different environmental

protection regimed and regulations. The ocean is the continuous fluids medium. However, and the ecosystem , migratory fish and pollutants do not recognize the new jurisdictional boundaries.\*3

Thermal pollution is not a serious problem in the marine waters of Southeast Asia, although it is of major local importance where hot waters are discharge directly into the rivers from liquid natural gas(LNG) and power plans. Conventional thermal power plans are scattered throughout the region, with the greatest concentration in the vicinity of the large cities, particularly Manila, - Bangkok, Singapore, Jakarta and Jahore Baru area.\*4

Organic and biological pollutant include first, human waters, agricultural wastes such as palm oil, rubber and tapioca, processing waters, animal excrement and commercial fertilizer .Discharges from food and beverage processing and from textile, palm oil, rubber and paper industries. Almost all large cities of the region are coastal on rivers that discharge into the sea. The highest densities of population are on the island of Java in Indonesia. The west coast of the island of Taiwan, the metropolitan area of Manila, Bangkok, Singapore and some additional areas in the Philippines and Indonesia.

The most extensive sewage pollution occurs in the strait of Malacca, near Bangkok and sourrounding communities in the upper gulf of Thailand in the Hongkong region on the north and west coast of the island of Taiwan and in the Manila and Jakarta metropolitan areas. Jakarta and Surabaya are centers of industry and most industrial plants in this cities lack waste water treatment facilities. There is little industrial activity in the Eastern part

of Indonesia.

Several generalizations can be made about marine pollution in the Southeast Asia. First, the countries shores are genuine concern about the treat of marine pollution in the region especially the threat of oil pollution by vessel and offshore drilling installations. Other sources of marine pollution have lower priority. The second concern about oil pollution is not matched by appropriate preventive and remedial legislation and enforcement, and thirdly the interest is apparent in various modes of regional cooperation for marine pollution prevention and control.

The level of concern and capacity to respond to environmental pollution vary widely from country to country. Although all have some environmental provisions in their earlier laws pertaining to the safety health, welfare of public, their more intense effort to tackle pollution are recent. Among the ASEAN countries the Philippines was the first to introduce major pollution control legislation, RA 3931 in 1964. Singapore responded to marine pollution with the passage of its prevention of pollution of the Sea Act of 1971.

Malaysia enacted its major environmental legislation, the Environmental Quality Act in 1974. Indonesia have introduced Law.No.4 of 1982 concerning the basic provisions to organize life environment LN.No.12 th.1982 TLN No.3215. Thailand has not introduced any new environmental laws but has improvised up on existing laws relating to sectoral matters by introducing subsidiary regulations for pollution control.

The countries have chosen different strategies to combat



pollution. The Philippines has a strategy of variable effort standards. By prescribing what the ambient water quality criteria and standard should be. Because of the expected cost of administering the strategy of effluent variable standard. Singapore and Thailand have adopted the strategy of introducing uniform standards. Malaysia has introduced a mixed strategy. Issuing two standards for treated sewage and industrial effluents .

Indonesia has contemplated adopting a multiple uniform standard strategy by issuing four sets of uniform standards for discharging into four types water bodies designated or used for drinking water and domestic water supplies, fisheries, agricultural, industry and urban drainage waste transport. The principal transnational pollutant receiving coordinated regional attention is oil.

Two bodies have been established by ASEAN to deal with oil pollution. The first one is the ASEAN Council on Petroleum (ASCOPE) which deals mainly with the environment consequences of the exploration for petroleum and natural gas. The second one is the ASEAN expert group on Marine Pollution. ASCOPE has been discussing standardization of environmental and safety regulations for offshore drilling and the local complexities of combating transnational oil spills. The expert group has organized a contingency plan for the control and mitigation of marine pollution that provides for a system for alerting member countries if major oil spills occur within region. The plan provides for exchange of information on operational capacities to combat pollution within each nation, and a program of mutual assistance to cope with oil spills that member countries can not handle alone. Specific features of the plan include;

- Adequate and coordinated, contingency planning by the governments concerned
- Responsibilities of the appointed institution to report immediately to the established emergency control centres.
- Availability of sufficient and appropriate recovery and containment equipment including vessels.
- Availability of adequate sloop tanks on shore, capable of receiving contained oil spillages.
- Availability of trained personnel for the clean up operation.

ASEAN is attempting to develop a regional governmental approach to prevent and combat of oil spill management based on coordinated policies and cooperative programs. The states have also required national and foreign oil companies to develop their own capabilities to support the government policies. With the assistance of the Intergovernmental Maritime Organisation (IMO), and the United Nations Environment Program (UNEP). Indonesia, Malaysia and the Philippines develop an action for the Celebes Sea that is intended to reflect the underlying philosophy of the ASEAN contingency plans. In June 1979 the first ASEAN working group meeting on marine sciences identified marine pollution problem areas requiring strong scientific input through regional cooperation.\* 5

Also the activities of the intergovernmental Oceanographic Commission (IOC) of the United Nations Education Scientific and Cultural Organisation's working group for the Western Pacific (WESFPAC) include marine biology and pollution. In addition to their various national regulations regarding oil pollution described above, Indonesia,-

Malaysia and Singapore are signatories to a navigation safety agreement for the strait of Malacca and Singapore.

Under this agreement ,all tankers and large vessels navigating these straits must carry adequate insurance and compensation coverage .There is also a dollars 1.3 million US dollar revolving fund established by Japanese Shipping interests and the straits nations to cover the costs of cleaning up and preventing oil spills from tankers.

A regional Act Plan for the South East Asia Seas was drafted in 1979 and adopted by the five ASEAN states at the intergovernmental meeting convened by UNEP in Manila in 1981. This action plan is expected to act as the nucleus for the development of a wider program for the East Asian Seas.\*6

A co-ordinating body on the seas of East Asia (COBSEA) was formed to serve as the overall authority to determine the content of the action plan, to review its progress and to approve a program for its implementation. One of the projects of COBSEA is the survey of sources and monitoring of oil pollution coordinated by Lemigas. In 1984 , a regional technical meeting was held in order to adopt standardized methods of sampling, analysis and reporting to facilitate the regional interpretation of the data.

Another regional co-operation effort to mitigate oil from accidental oil discharges has been initiated by the ASEAN Council on Petroleum (ASCOPE) to deal specifically with the transporting of oil pollution. Co-operation among Indonesia, Malaysia and Singapore for the protection of the marine environment in Southeast Asia is quite advan-

ced particularly in the strait of Malacca. The Showa Maru grounding which released 5000 tons crude oil into the strait of Singapore has promoted the funding of a regional spill contingency plan. Three coastal states have also initiated formal discussions with Japanese maritime economist and reached an agreement to institute two particular measures as a means of minimizing shipping accidents. First, vessels in transit should maintain an under keel clearance of 3.5 meters throughout the straits of Malacca and Singapore ; Secondly, a traffic separation scheme (TSS) for all vessels should be established for "one fathom bank in the vicinity of port Kelang.\*7

#### V1.2.1.THE LAW OF THE SEA 1982 ABOUT MARINE ENVIRONMENT.

Part XII of the new convention consisting of 46 articles, is the first attempt to provide a comprehensive framework of conventional rules covering all sources of marine pollution .Very extensive regulations on protection and preservation of the marine environment are inserted in that part XII. Article 192 embodies a general obligation whereby states have the obligation to protect and preserve the marine environment.

It is further stated in article 193 that states have the sovereign right to exploit their natural resources, pursuant to their environment policies in accordance with their duty to protect and preserve the marine environment

In honouring this obligation states have a duty to use the best practicable means at their disposal and in accordance with their capabilities ( article 194 ).\*8

Article 194, states that shall take all measures necessary

to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other states and their environment

The measures taken shall deal with all sources of pollution of the marine environment. These measures shall include inter alia ,those to minimize to the fullest possible extent;

- To release of toxic ,harmful or noxious substances which are persistent,from land base sources,- from or through the atmosphere or by dumping.
- Pollution from vessels in particular measures for preventing accidents and dealing with emergencies preventing intentional and unintentional discharges,equipment,operation and manning vessels.
- Pollution from other installation and devices operating in the marine environment.
- The states are placed under an obligation to tackle pollution through the adoption of national legislation on the establishment of global and regional rules,a combination of national legislation and international norms.
- National legislation must ensure that dumping is not carried out without the permission of national authority. Moreover dumping within the territorial sea or the exclusive economic zone or onto the continental shelf may not be carried out without the express prior approval of

the coastal countries.

Article 211 concerning pollution from vessels includes two provisions on the exclusive economic zone. The coastal states may adopt laws and regulations giving effect to generally accepted international rules, thus making these rules enforceable in the exclusive economic zone (EEZ). Where the normal international rules are inadequate to meet the special oceanographical and ecological circumstances, provisions are made for especially vulnerable areas of the EEZ subject to stringent safeguards to be applied by the competent international organisation.

The coastal states may adopt special mandatory measures applicable to such special areas. Provisions are made to ensure that incidents involving or threatening discharges will be promptly notified to states which may be affected; According to the convention, states shall directly or through competent international organisation promote programs of scientific, educational, technical and other assistance and preservation of the marine environment and the prevention, reduction and control of marine pollution. Such assistance shall include;

- Training of scientific and technical personnel.  
Facility for participation in relevant international programs.
- Supply the necessary equipment and facilities.
- Enhancing of their capacity to manufacture such equipment.

The environment has to be preserved for today and tomorrow. It is an obligation for mankind to preserve its surroundings. This statement was made in June 1972 in Stock-

holm Sweden during the United Nations Conference on the Human Environment. All participants were aware of the fact that the environment is subject to depravities due to its im-moderate and uncontrolled exploitation or utilization.

It is generally recognized that pollution has developed into serious environmental problems. The Stockholm conference adopted a declaration of the human environment which included in principle 7 and 21 a general obligation to states to preserve the marine environment as follows;

Principle.7 :

States shall take all possible steps to prevent pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life ,to damage amenities or to interfere with other legitimate use of the sea.

Principle 21:-

States have, in accordance with the charter of the United Nations and the principles of the International Law, the sovereign right to exploit their own resources pursuant to their environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to environment of other states or of areas beyond the limits of national jurisdiction.

The importance of the preservation of the environment particularly the marine environment or the seas has been

recognized by the new United Nations Convention on the Law of the Sea 1982. Thus part XII which contains 45 articles on inspection deals with the preservation and protection of the marine environment. Moreover that convention in its preamble state that " The states parties to this convention recognize the desirability of establishing through it with due regard for the sovereignty of all states ,a legal order for the seas and the oceans which will promote the peacefull uses of the seas and ocean,the equitable and efficient utilization of their living resources and the study protection and preservation of the marine environment.The marine environment and the living resources which it supports are of vital importance to all nations".

#### VI.2.2. LAW OF THE SEA AND PRACTICE IN ASEAN COUNTRIES.

Of the five ASEAN nations,only Malaysia and Thailand ratified the 1958 Geneva Convention on the continentsl-shelf.Take for example Indonesia did not ratified it because the Geneva Conventions of 1958 did not include the archipelagic state concept.Indonesia adopted only the convention on the High Seas.\*9

The continental shelf is therefore governed by national legislation consisting of a decree enacted on March 17,1970 and a law enacted on June 6,1973. The Petroleum industry in Indonesia is governed mainly by the petroleum and the Law Act of 1960(the first to be passed since independence,here after referred to as Decree 476 of 1961, Law No.44 specifies neither the nature of the relationship between the state enterprises and the contracting parties,nor the fiscal provisions relating to petroleum operations.



The terms and conditions under which most companies operate contained in their production sharing contract. In 1969, Indonesia proclaimed its sovereign rights over all mineral and other living and non living resources in the sea-bed and sub soil outside territorial limits to the maximum distance that can be exploited, where such shelves have a border with another state. The border line would be determined by negotiation.

### VI.3. NATIONAL LEVEL.

In Indonesia ,responsibility for the control and combat of Marine Pollution or of activities that can pollute coastal waters is fragmented among several departments at national level and among various local bodies.

For example the Ministry of Agriculture regulates the import and use of biocides, the Ministry of Mines and Energy controls off-shore mining, the Ministry of Health sets water quality standards, and the municipality of Jakarta regulates sand and coral dredging and the release of Industrial effluents. Counter measures against pollution are coordinated by the Directorate General of Sea Communications , Directorate of Marine Safety supported by the Department of Mines, Pertamina Shipping Division and the coordinating body for the Department of Defence ( Navy and Water Police) and units of any other agency required under emergency conditions.

The Ministry of Research and the Ministry of Justice each has a committee for Marine Pollution. Pertamina Limited Company (P.T. Pertamina) is the state oil company under the Ministry of Mines and Energy. This state oil company performs this task in oil and gas terminals.

Fire fighting in port and at sea is primarily a task of the coastguard but the coastguard does not have special fire fighting vessels, but they have fire-trucks in ports, and most of their patrol boats have fire fighting equipment.

Pertamina operates some fire-fighting vessels. Pertamina

has the operational capacity to clean up oil spills.

Pertamina units to combat oil pollution are stationed in the Straits of Malacca, in the Java Sea and in the Makassar straits, including Irian Jaya and Cilacap as well. They have special contingency plan to collaborate with similar organisations in Malaysia and Singapore to take counter-measures against oil spills in the hazardous Straits of Malacca.

Anti-pollution measures are planned, controlled and coordinated by the Sub-directorate of Pollution under the Directorate of Marine Safety in the Directorate General of Sea Communications. At present time this directorate general does not have anti-pollution equipment and therefore contracts private companies, such as Pertamina and Caltex for this operation.

Developments in the firefighting sub sector are strongly related to developments in the coastguard sector. The Directorate General of Sea Communications does not anticipate acquiring special fire-fighting vessels.

The situation in the anti-pollution sub-sector is different. According to the maritime sector investment programs the Directorate General of Sea Communications plans to purchase two anti-pollution vessels before 1989. They will be operated by the Pollution Sub-directorate of the Directorate Marine Safety under the Directorate General of Sea Communications.

But for the time being it is the policy of the Indonesian Government that oil pollution originating from the off-shore operations is one of purely national concern

and that any problem can be dealt with by the public authorities in charge and the oil companies involved.

The operating company is required to have an approved contingency plan and to keep all necessary equipment readily available. The penalty for violations can be as high as one million dollars ( US 1.000.000 dollars ).

Little has been done to develop a system of civil liability for oil pollution damage resulting from off-shore activities. As of October 1982 there was no mandatory provision for off-shore exploration and exploitation activities. Indonesia participated actively in the International Legal Conference on Marine Pollution Damage in 1969 and in the International Conference on the Establishment of an International Compensation Fund for Oil Pollution in 1971, both held in Brussels.

The City of Jakarta as a capital city of Indonesia has introduced a specific regulations No.BD.15/4/36/70 LD No. 19 in 1970 dealing with the prohibition of discharges of oil from tankers into waters around the thousand island group (Gugusan Kepulauan Seribu).

So far Indonesia is the major off-shore oil producer in the region. In either case the maritime safety administration needs to ensure that there is a necessary contingency plan to deal with marine pollution when it occurs in and around the Indonesian waters or waters of developing countries so as to be able to ready harness all available national recourses for the purpose.

Further, even for any sub-regional or regional cooperation in combating marine pollution, the existence of a national

contingency plan in each of the countries concerned would have been a precedent condition.

Regional cooperation among Indonesia, Malaysia and the Philippines in the South East Asian region has been established for the combat of marine pollution in which the centred office of this respected regional cooperation is located in Davao the Philippines. So it is very useful and necessary to intensify and extensify the respected regional cooperation in order to cope with the prevention extend of marine pollution.

#### VI.4.INTERDEPARTMENTAL CO-OPERATION.

Appropriately, Indonesia has introduced laws and regulations dealing with the combat of marine pollution in line with the protection of life environment as a whole.

- 1.Law No.4 of 1982 concerning the basic provisions to organize life environment ( L.N.No.12 th.1982,TL No.3215 ).
- 2.Presidential Decree No.65 of 1980 concerning the ratification of International Convention for Safety of Life at Sea, 1974 ( L.N. 65 th. 1986. )
3. Presidential Decree No.46 of 1986 concerning the Ratification of International Convention for the Prevention of Pollution from ships 1973 and Protocol of 1978 relating to the International Convention for the prevention of Pollution from ships 1973 ( L.N.No.59 tahun 1986 of 9 th September 1986.

4. The Decision of the Minister of Communications No.KM.167/KM.207/Phb-86 concerning International Certificate for Prevention of Pollution by Oil and International certificate for prevention of pollution by noxious liquids.
5. The Decision of the Director General of Sea Communications No.Py.69/1/11-86 concerning the implementation of the Ministerial Decision No.KM.167/Km.207/Phb-68 concerning International Certificate Prevention of Pollution by oil and International certificate for prevention of pollution by noxious liquids.

However, since the establishment of the Ministry of State for Population and Environment, there has been effort to integrate the environmental element into the country's socio-economic development strategy. This ministry's authority is limited to the co-ordination of environment related activities and formulation of a general environmental policy and guidelines.

Regulatory powers remain in the hands of sectoral agencies such the Ministry of Communications, the Ministry of Industry, the Ministry of Public Works, the Ministry of Mines and Energy and the Ministry of Agricultural and the Ministry of Public Health. Therefore, it has to be born in mind that for such coordination and cooperation, interdepartmental, ministries will be the best way in order to cope with the prevention of marine pollution as a national concern and effort.

## VI.5. DIRECTORATE OF MARINE SAFETY AND HARBOUR MASTERS.

According to the rules of the Directorate General of Sea Communications the main task of the Sub-directorate of Sea Pollution is to manage, supervise and administer the cases of sea and coast pollution. The management functions of the Sub-directorate also comprises planning, licensing and supervision.

Since the product of IMO, the International Convention for the Prevention of Pollution from Ships and the Protocol of 1978 relating thereto, problems may arise in order to implement and fulfil the requirements of these conventions such as follows ;

- The poor capability of the organisation to carry out the necessary functions in order to combat marine pollution.
- Inadequate people to do the job concerning the prevention of marine pollution.
- Inadequate infrastructure, as regards equipment and reception facilities for ensuring prevention of pollution from ships.

Management functions at the Sub-directorate of the Sea Pollution also comprises the planning, licensing and supervision of the inputs, the reports from the harbour masters all over Indonesia concerning pollution incidents and the outputs which consist of regulations, licences and advice. The coordination links shows connections to the port administrations, the Harbour Master offices and

third parties as well. Indonesia has ratified the International Convention of Pollution from ships 1973 and protocol of 1978, through Presidential Decree No.46 of 1986 and the Decision of Minister of Communications No.KM.167/207/Phb-86 concerning International Certificate for Prevention of Pollution by Oil. The provisions of this convention cover the design and equipment of ships, surveys and inspection in order to ensure that the design and equipment comply with the relevant international standard and cover the operations of ships in so far as this concerning the protection of the marine environment.

The primary responsibility for securing that objectives in relation to any particular ship rest with the Directorate of Marine Safety in Indonesia. Harbour Masters on behalf of administration ( Government ) make effective use of the opportunities that port state control provides for identifying deficiencies and substandard operations. If any, in visiting foreign countries which ships may render them pollution risky and for ensuring that remedial measures are taken. A ship required to hold a certificate in accordance with the relevant provisions under Marpol 73/78 is subject to port state control. In this case the control procedures aim to identify such a pollution risk and to provide the basis for remedial action.

Furthermore, harbour masters sometimes find a number of factors which may cause the conditions of a ship to be considered as posing a threat of harm to the marine environment. These factors can be categorized as follows;

- a. Non-compliance with the construction or equipment requirements of the convention.



b. Inoperative or malfunctioning equipment.

c. Non compliance with the operational requirements of the convention .

Procedure for the control of ships under article 5 of the Marpol 73/78 ( annex 1. ) when in inspecting foreign ships which is required by Marpol 73/78 to hold a certificate.

Any such inspection shall be limited to verifying that there is on board a valid certificate, unless there are clear grounds for believing that the conditions of the ship or its equipment does not correspond with the particulars of that certificate.

If the ship does not carry a valid certificate, the harbour master takes such steps as will ensure that the ship shall not sail until it can be proceeded to sea without presenting an unreasonable threat of harm to the marine environment. However, he may grant such a ship permission to leave the port or off-shore terminal for the purpose of proceeding to the nearest appropriate repair yard available. With regard to this case ,harbour masters may undertake an inspection on the basis indicated above;

- At their own initiative.
- At the request of or on the basis of information provided by another party.
- On the basis provided by a member of crew, a professional body, an association and trade union etc.

Harbour masters will then have to determine whether to detain a ship until the deficiencies are corrected to

allow it to proceed to the nearest appropriate repair yard available after taking temporary measures as necessary or to allow it to sail with certain deficiencies which are not vital from the view point of avoiding an unreasonable threat of harm to the marine environment. If the harbour master permits a ship with known deficiencies to proceed to a repair yard, a report should be submitted to the flag state. In addition it should;

- if that repair yards is under its own jurisdiction continue to exercise appropriate port state control.
- if that repair yard is under the jurisdiction of some parties other than the flag state communicate all the facts to the authority of that party.

In the exercise of port state control, the harbour master may take any action against a foreign ship for non-compliance with the provisions of the present convention. The government of Indonesia as a party shall immediately notify the consul or diplomatic representative of the flag state or if this is not possible, the administration of the ship concerned of all circumstances. If such notification is made verbally it should be subsequently confirmed in writing.

A report on alleged deficiencies or an alleged contravention of the discharge provisions should be forwarded to the flag state as soon as possible, preferably not later than sixty days after the observation of the deficiencies or contravention.

There are some international conventions concerning prevention of pollution of the sea by oil which has to be

implement and supervised by the Indonesian Harbour Master such as ;

- International convention for the Prevention of Pollution of the Sea by Oil, 1954 amended in 1962 and 1969.

The first step towards the international control of marine pollution was taken in 1954, when a conference held in London adopted the International Convention for the Prevention of Pollution of the Sea by the Oil.

The principal object of the 1954 convention was the achieved by prescribing certain prohibited zones extending to at least 50 miles from the nearest land, within which the discharge of oil and oily mixtures (containing 100 parts of oil per million parts of mixture or more) was prohibited. The 1954 Convention entered into force on 26 July 1958. In 1962 the IMO convened a conference which adopted the amendment to the 1954 Convention and 1962 Amendment concerned entered into force on 28 June 1967.

In 1969 the IMO adopted further extensive amendments, which prohibited oil discharge through the normal operation of a ship except under the following conditions;

- a. The total quantity of oil which a tanker may discharge in any ballast voyage must not exceed 1/15.000. of the total cargo carrying capacity of the vessel.
- b. The rate at which oil may be discharged must not exceed 60 liters per mile travelled by the ship and no discharge of any oil whatsoever must be made from the cargo spaces of a tanker within 50 miles of the nearest land.

The 1969 Amendment made the load on top operation possible within the convention. The 1969 provided for a new form of oil record book which was designed to show the movement of cargo oil and its residues from loading to discharging on a tank to tank basis.

The 1969 Amendment to the 1954 Convention entered into force on 20 January 1978. The International Conference on Tanker Safety and Pollution Prevention 1978 (TSPP) was the culmination of ten months work by the member states and the secretariat of IMO. The conference was called up on to strengthen these earlier convention in order to provide more effective regulatory regimes for oil tankers.

The TSPP Conference adopted the Solas Protocol and the Marpol Protocol. The Solas 74 Convention entered into force on 25 May 1980 and the Solas Protocol 1 May 1981. Marpol 73 as amended by the Marpol Protocol entered into force on 2 October 1983.

The first set of amendments entered into force on 6 January 1986. Annex.1 of Marpol 73/78 is the Prevention of Pollution by Oil and the requirements of annex.1 of this convention as follows;

- a. Oil is defined as petroleum in any form including crude oil ,fuel oil,sludge,oil refuse and refined products.
- b. When discharging oil,tankers and other vessels must have in operation an oil discharge monitoring and control system and oily-water separating filtering equipment.

- c. Specific criteria for the operational discharge of oil into the sea have been established.
  
- d. Parties to the convention are obliged to ensure the provision of adequate reception facilities for residues and oily mixtures at oil loading terminals, repair ports and in other ports in which ships have such residues to discharge. The requirements related to equipment and constructional features can be summarized as follows;
  - a. Oil tankers must be fitted with oil discharge and monitoring equipment, with a recording device to provide a continuous record of the discharge.
  
  - b. Any ship of 400 tons gross tonnage and above must be fitted with an oily-water separating equipment filtering system.
  
  - c. Oil tankers must be provided with suitable slop tank arrangements with the capacity necessary to retain the slops generated by tank washings, oil residues and dirty ballast residues.
  
  - d. New oil tankers of 70.000 dwt and above (as defined in the Marpol Protocol 78) must be provided with segregated Ballast Tanks (SBT) of sufficient capacity to enable them to operate safely on ballast voyages, without recourse to the use of oil tanks for water ballast except in very severe weather conditions.

e. New crude oil tankers of 20.000 dwt and above and new product carriers of 30.000 dwt above as defined in Marpol Protocol 78 must be provided with segregated ballast tanks (SBT) which must be protectively located (PL) and new crude oil tankers must be provided with a crude oil washing system (COW).

f. Existing crude oil tankers of 40.000 dwt and above must be provided with SBT, dedicated Ballast Tank (CBT) and COW Crude Oil Washing.

g. New oil tankers must comply with the subdivision and damage stability requirements to ensure that they can survive assumed side or bottom damage.

However a ship while operating at sea even in a special area can discharge oil or oily mixture when;

- The discharge is necessary for the purpose of securing the safety of a ship or saving the life at sea.
- The discharge of substances containing oil approved by the administration are utilized for the purpose of combating specific pollution incidents in order to minimized the damage from pollution.

Marpol 73/78 has introduced certain requirements for the construction and equipment of ships with respect to the prevention of operational discharges of oil and the mitigation of uncontrolled release of oil. The main features of constructional requirements introduced by the conven-

tion are the following;

- SBT : Segregated Ballast Tank.
- CBT : Dedicated Clean Ballast Tank.
- COW : Crude Oil Washing System.
- IGS : Inert Gas System.
- PL : Protective Location of SBT.
- Oily water separator equipment and oil discharge monitoring and control systems.

A ship shall carry the required manuals approved by the administration ( Harbour Master ) and operate in accordance with those above provisions. But last but not least the role of classification society in this case is very important. We should not forget that after this convention entered into force, a new ship has to fulfil all the requirements which are mentioned above.

#### VI.6. RECEPTION FACILITIES.

The provision of facilities by all parties recognising OIL POL 54, for dirty ballast tank washings and other oil residues was shown to be inadequate, and led in part to the additional provisions of annex.1 of MARPOL 73/78.

These require governments to ensure facilities at loading terminals, repair ports, and at other ports where ships have oily residues and oily mixtures remaining from oil tankers and other ships and which are adequate to meet the needs of ships using them without causing undue delay to those ships. The problem concerning the provision of reception facilities at ports often lies in the justification of their installation on economic grounds.

The facilities provided can vary from extensive settling tanks and separation equipment to barges or even road tankers . At larger harbours where the quantity to be pumped ashore can be high, then economic justification is relatively easy, since the deballasting tankers can be charged for each ton of oily waste passed ashore.

The settled residues can than often be refined or used locally for low grade fuel. However the collection and disposal of small quantities of contaminated residue are expensive to collect and dispose of.

In view of the problem discussed in the previous section on sludge discharge this is a serious obstacle. Thus while it is the large tankers which for visibility and emotive reasons, catches the headlines of the prevention of pollution by smaller vessels which dump bilge and sludge in the vicinity of harbours, may become more



important for control in the future. The discharge of oily wastes into relatively confined or high density sea areas has been recognised in annex.1 of MARPOL 73/78 by designation of the special areas. It is applied that whenever possible ships should retain oily wastes on board and use available reception facilities.

It is expected that those countries such as Indonesia, Malaysia ,and Singapore which are party to the convention will ensure adequate reception facilities at all oil loading terminals and repair ports. Indonesia in this case has applied those reception facilities in every important loading and repair port, in order to fulfil the convention. Clearly if stringent pollution regulations are to be applied near coastlines, then adequate facilities must be made available.

#### VI.7. CONSEQUENCES.

Consequencies arising from pollution cause serious disturbances. Take for instance oil contamination in Indonesian waters. Although oil pollution occurs most commonly in the waters near densely populated areas such as large cities and ports, contamination is not only due to oil activities, but also to other factors, such as follows;

- a. The utilisation of petroleum related products like fuels and lubricating oils for transportation and industrial activities.
- b. The direct discharge of untreated municipal and industrial wastes containing many refined and partly - weathered oil through sewers and rivers.

- c. The discharge of effluents generated during the production and processing of crude oil (i.e. of oil production platforms and refineries.)
- d. Oil spills arising from tanker accident and operational discharges such as tank washings and deballasting.
- e. Pollution by noxious bulk liquids and harmful goods.
- f. Sewage and garbage.
- g. Pollution from other installations, operating in the marine environment.
- h. Pollution from offshore installations and waste disposal in the deep sea.

The above mentioned pollutants may possibly cause serious disturbances to the supply of fisheries. The loss of marine produce is implied in the reduction, in the quantity and quality of marine produce available to man as consumer.

The reduction in the quantity and quality of marine produce particularly the supply of fish means for the fishermen loss of revenues and for the consumer scarcity of fish products available in the market. In Indonesia this case can be a very big problem because there are 602,000 fishermen and the number of full time fishermen was 97,000. Thus fishing problems due to marine pollution will cause a very serious disturbance.\*9

Pollution can cause damage to installations within the port and the ships. Pollution when causing damages to beaches impair such activities as tourism and all other

activities connected to tourism. Pollution is a danger of impaired health by contracting diseases from polluted seas.

Any one should bear in mind what had happened in Minamata Japan . Many people died and several were seriously sick after having eaten fishes contaminated by mercury released in sea water. \*10.

As early as 1922, oil killed birds on her shores caused Great Britain to pass a law forbidding oil and waste dumping in her territorial waters, and come the death of ten of thousands of birds from the Torrey Canyon spill, causing schock waves around the world. \*11.

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## CHAPTER.VII

### CONCLUSION AND SUGGESTIONS

#### VII.1. CONCLUSION.

- 1.Indonesia is a maritime nation comprising a large number of small to large islands scattered in vast sea areas.Therefore the shipping sector in Indonesia plays an important role for the development of the national economy as well as the social and industrial sectors.
- 2.Responsibility for the control and combat of marine pollution or of activities that pollute coastal waters is fragmented among several departments at a national level and among various local bodies.
- 3.The Ministry of State for Population and Environment has the main task to integrate the environmental element into the country's socio-economic development strategy. However,this ministry authority is limited to the co-ordination of environment related activities and formulation of a general environmental policy and guidelines,but the regulatory power remain in the hands of sectoral agencies. Therefore,it has to be born in mind that for such co-ordination and co-operation,an inter-departmental system will be the best way in order to cope the prevention of marine pollution.
- 4.Marine pollution in Indonesian waters is not solely due to activities such as;wastes from industries discharging and deballasting but can also be attributed to other activities,such as fishing,aquaculture occuring

in Indonesian waters adjacent to densely populated areas, harbours and shipping ports.

5. Pollutants can cause serious disturbances to the fisheries supply. The loss of marine food implies in the reduction in the quantity and quality of marine produce available to man as consumer.
6. The reduction in the quantity and quality of marine produce, particularly the supply of fish means for the fishermen loss of revenues and for the consumer scarcity of the fish product available in the market.
7. Pollution can cause damage to installation, within port and to the ships. Pollution when causing damages to beaches impair such activities as tourism and all other activities connected to tourism.
8. Oil pollution can kill birds. Anyone should bear in mind what had happened in Great Britain in 1922. Oil killed birds on the shores which caused Great Britain to pass a law forbidding oil and waste dumping in her territorial waters. Another example is the death of ten thousands of birds from the Torrey Canyon spill which causing shock waves around the world.
9. Pollution is dangerous because of impaired health by contracting diseases from polluted seas. We should remember what happened in Minamata Japan a couple years ago, many people died and several were seriously sick after having eaten fish contaminated by mercury released in sea water.
10. The Minister of Communications is the top leader in

that department who performs part of the governmental and developmental tasks in communications. As the top leader the minister makes and carries out his policies in order to undertake and foster the tasks of communications.

11. The Director General of Sea Communications is the responsible leader in sea communications who receives authorization from the minister of communications to carry out part of his tasks in sea communications.

12. The Director of Marine Safety is an assistant to the Director general who carries out the policies and part of the tasks of the Director General in marine safety and prevention of marine pollution from ships.

13. The harbour master is the executor of the policies of the director of marine safety as well as an enforcer of various regulations in terms of shipping, marine safety and control of marine pollution.

14. The Head of the Regional Office of the Directorate General of Sea Communications (Maritime District Office) is a deputy of the director general and performs the tasks of the director general in his territory.

15. In accordance with statistics the strait of Malacca is the busiest part of Indonesian waters and it might be considered as the most vulnerable area for oil pol-

lution due to the increasing size and frequency of tanker operations. Most of the stranded tar-balls are products of weathering on crude oil.

Some of the crude oils come from spillages during loading or unloading activities and accidents including collisions and grounding. However, operational discharges from oil tankers such as tank cleaning is one of the causes of that kind of pollution.

Oil contamination due to refinery effluents consists of oil and its related products as well as non-oil pollutants, such as heavy metal like chromium, lead, and cadmium. Mercury has been mentioned as a possible contaminant coming from liquified natural gas and liquified petroleum gas plants.

16. Deballasting operations in the entrances of the Malacca Strait whether in the South China Sea or in the Indian Ocean probably more frequent because of the need to reduce the draft of large tankers before they traverse the shallow waters of the Malacca Strait.

17. Regional co-operation among Indonesia, Malaysia, Singapore and the Philippines in the South East Asian region has been established to protect coastal resources from the treatment of marine pollution by oil and other pollutants is promoted, where the littoral states have common economic interests to protect. Notwithstanding, there are some problems and constraints to such co-operation among the littoral states such as follows;



- a. Problems of the territorial integrity of the adjacent states.
- b. The existence of variable economic systems.
- c. The availability of a core (centre) for co-operative arrangements.
- d. Shortage of facilities and equipment as well as trained personnel.

The most demanding part of this regional cooperation approach is the joint activity such as the co-operative scientific research program, the joint venture in fisheries, or the development of petroleum activities. Informal contracts among these countries thorough symposia or seminar area relatively not expensive means of undertaking regional discussions to promote co-operative work.

18. The Directorate of Marine Safety under the Directorate General of Sea Communications which is responsible for prevention and control of marine pollution particularly from ships should play a very important role.

19. International Organisations play a very important role in attempting to prevent marine pollution. In accordance with the charter of the United Nations and principle 21 of the International Law. Countries have sovereign right to exploit their own resources pursuant to their environment policies, but they have the responsibility as well to ensure that their activities do not cause damage to the environment of other states or areas beyond the limits of national jurisdiction.

20. Pollution, whatever it is, in general is the responsibility of everyone. Everyone should be aware that the environment has to be preserved for today and tomorrow; it is an obligation for mankind to preserve its surroundings.

## VII.2. SUGGESTIONS.

1. The prevention and control of marine pollution is a pre-requisite for the reduction of pollution, but this can only be met if measures, such as stringent regulations and port state control are taken. Thus the government has to obtain this goal by the establishment of a more effective maritime safety administration.

An effective maritime safety administration provides the government with the machinery which would enable it to satisfactorily and efficiently undertake those functions which are embodied within the national merchant shipping legislation. These functions would include the implementation of the requirements of international pollution prevention conventions and national legislations.

2. The Administration should be responsible for providing and organizing the appropriate facilities for the survey and certification of ships and the training, examination certification of ship's master, engineers and other maritime personnel for organizing the port of state control.
3. National Maritime Legislation. An up to date Merchant Marine Legislation with precise dispositions as regard prevention of pollution from ships is a condition precedent to the effective enforcement of appropriate maritime safety and prevention of pollution standards.

The primary objectives of that legislation needs to be

developmental ,regulatory and in conformnity with relevant international conventions. The national legislation needs to be clearly and precisly worded with effective sanctions and capable of promoting a helpful law. .

4. The maritime administration particularly regarding prevention of marine pollution has to increase the frequency of surveys,inspection and certification of ships especially tankers,gas carriers and ships carrying dangerous goods.
5. The maritime administration authority has to ensure that there is a necessary national "Contingency Plan" and organisation to respond to maritime distress situations in waters adjacent to the country.
6. A programme for equipment and supply facilities to meet the minimum standards,so that all tasks can be performed to the optimum should be established.
7. Classification societies should be employed,since an administration can not fulfil all its obligations under the convention without employing classification societies to act on its behalf.The Government has decisions to make on the extent to which duties have to be undertaken by its directly employed surveyors and those which have to delegated to classification society.
8. More and better navigational aids,the use of pilotage for large tankers,careful surveillane of transiting ships as well as vigilance concerning the quality of a ship's crew are additional measures which should be

applied to reduce the probability of major oil spills.

9. The current practice of dumping garbage near the coastline for land reclamation purposes should be stopped, and alternative processing methods should be developed, such as incineration or composting.
10. It is suggested that a total ban be imposed on fishing vessels and aquaculture activities in the vicinity of the outfall to protect marine environment.
11. It is advisable to resort to other means of treatment of household sewage or to find a different site for the outfall, at least 6 nautical miles from the shore with better oceanographic factors.
12. Integrated coastal zone management all over Indonesian coast is required to prevent deterioration of the environment. The priority must be land use and water use planning particularly in the coastal plain and within estuaries.
13. Zoning of industries will further reduce ecological damage to the environment and determining the environmental sensitivity of important coastal areas and estuaries.
14. Ratification of International Conventions is very important, because it gives the opportunity to exercise an effective control of foreign vessels within the jurisdictional zones and to take any necessary measures against these ships if they are sub-standard.

15. Inter-regional co-operation. Contacts have to be established with neighbouring countries in view, of organizing meetings for the exchange of information about their respective experiences, such as harmonizing legislations, seeing in common what should be undertaken in cases of tremendous pollution.

16. Information. A substantial place should be reserved for TV, radio and school programmes concerning the marine environment pollution, the consequences of marine environment due to the pollution finally how to combat it.

This information can be reproduced as articles in newspapers, circulate either as booklets or brochures. Furthermore, the organization of national symposia, colloquia and seminars of it is necessary.

17. Training is quite important. Even if the administration is well organized, it can not fulfil its task if it does not have well trained and skilled personnel. This can be accomplished by the establishment of maritime schools.

Last but not least it is very important to take into consideration the existence of World Maritime University, - whose purpose is to provide advanced training for senior personnel.

There is no comparable institution anywhere else in the world.

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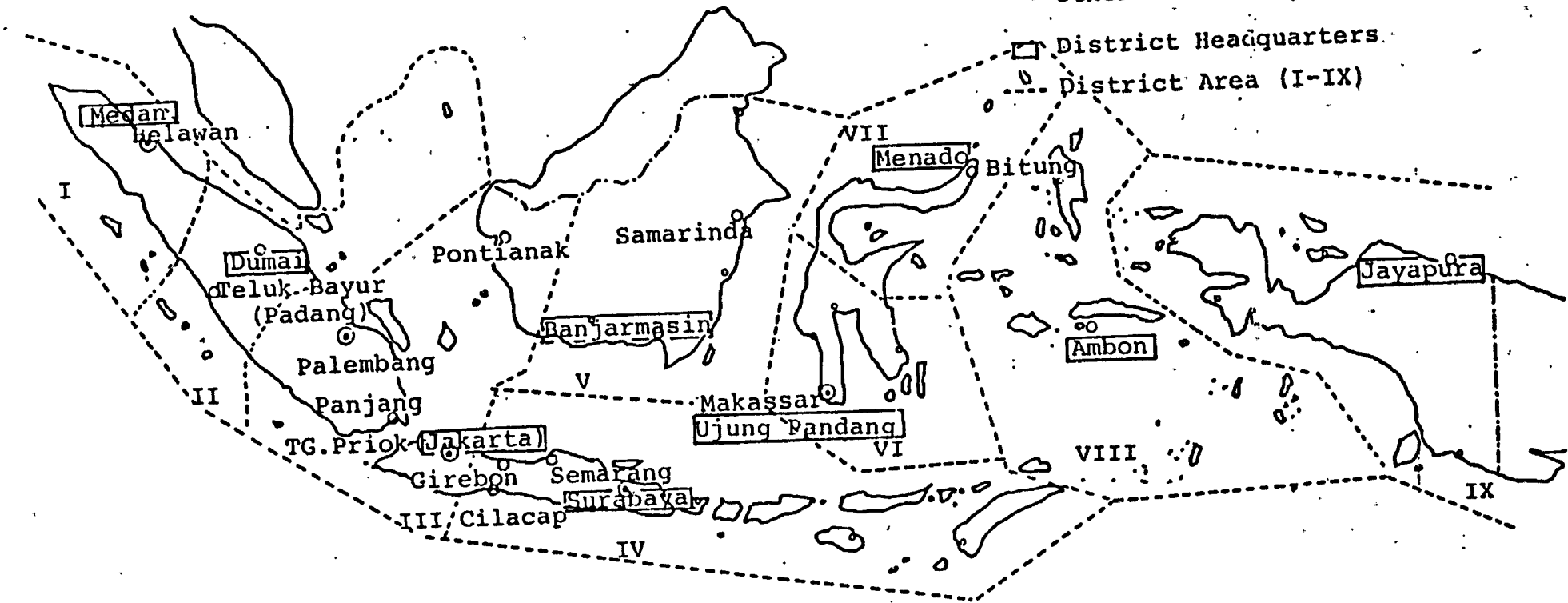


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DISTRICTS AND MAIN PORT IN INDONESIA

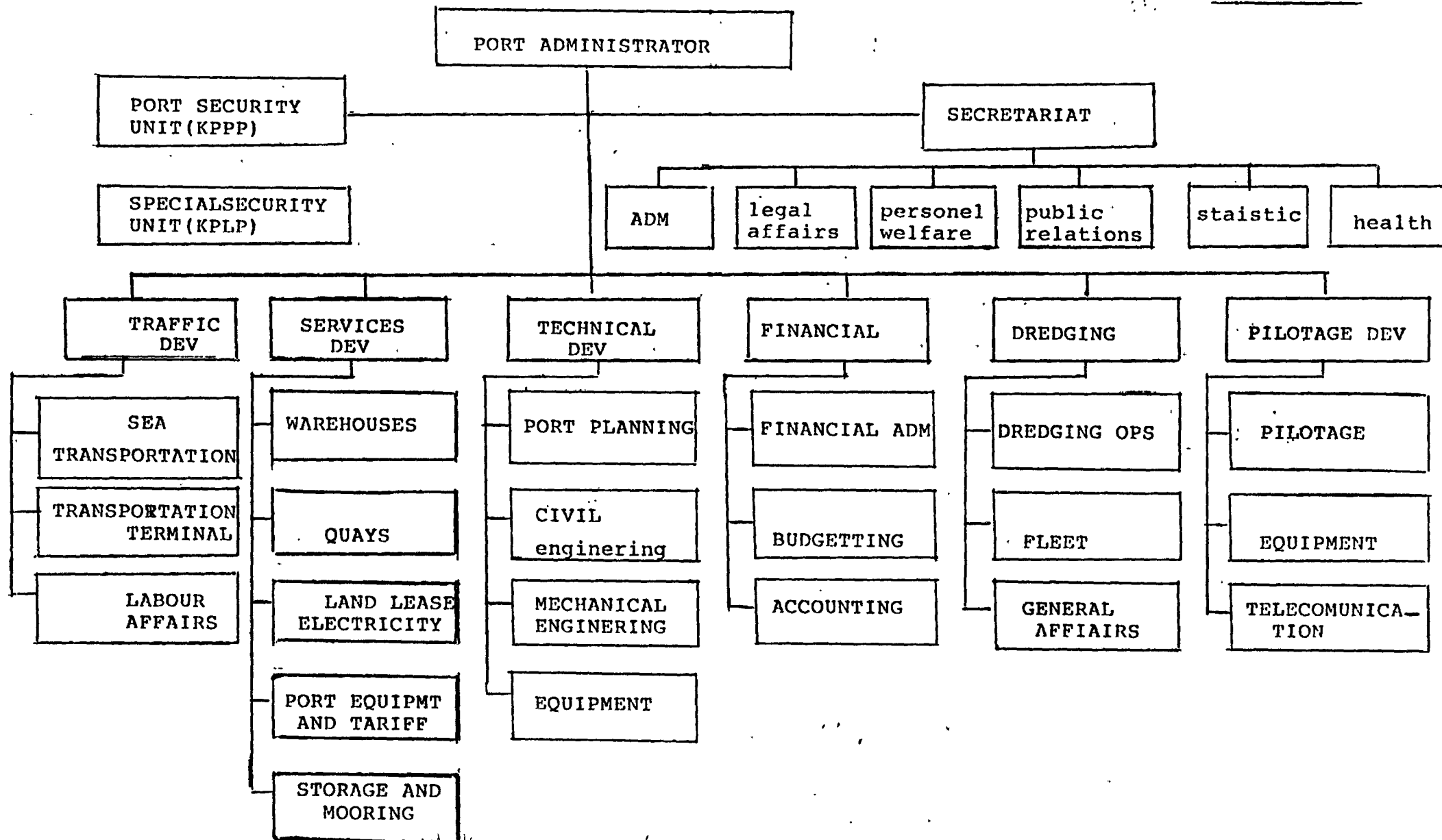
- ⊙ First Class Port
- Second Class Port
- Others

- District Headquarters
- District Area (I-IX)

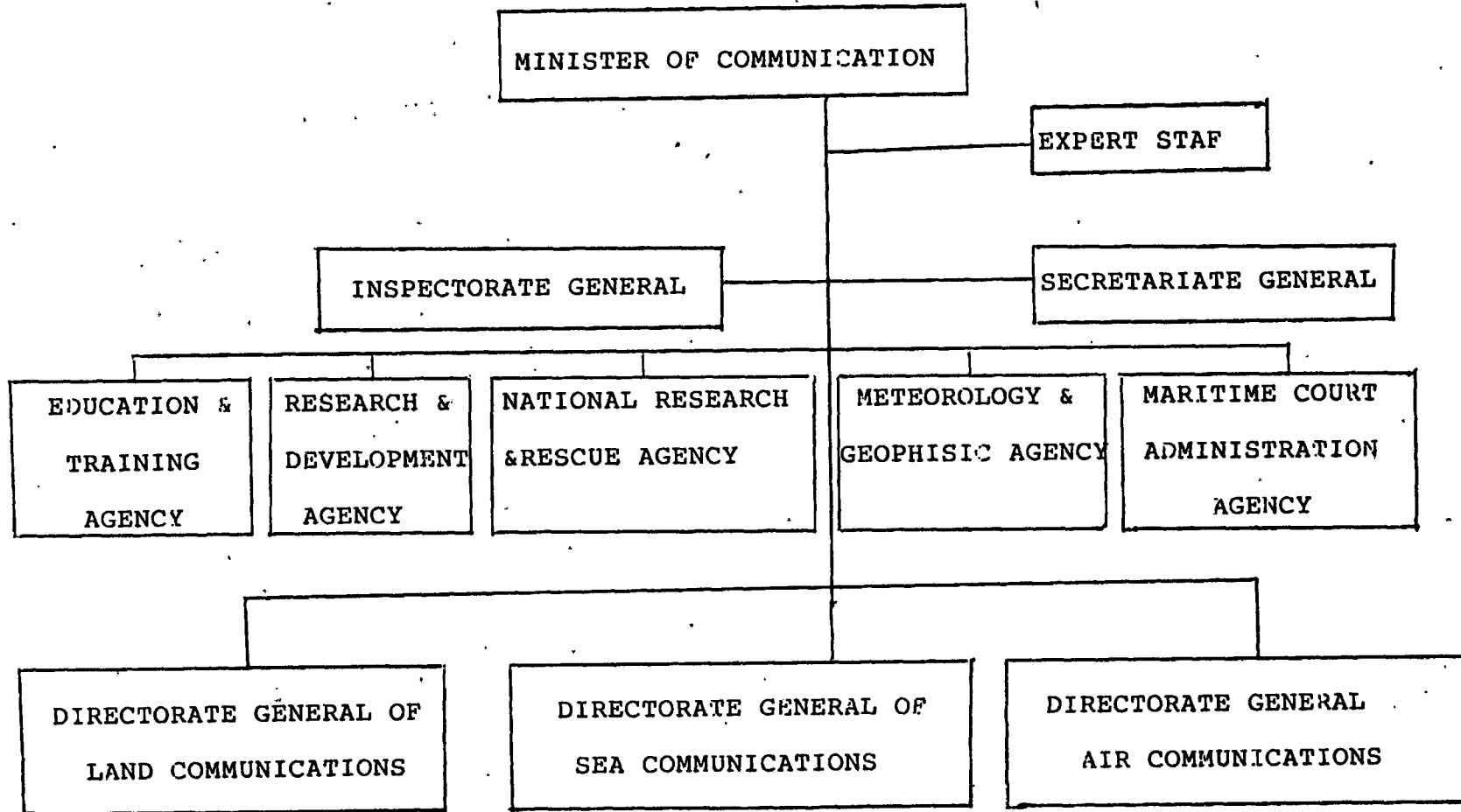


ORGANISATION CHART 1ST CLASS PORT AND 2ND CLASSPORT

Annex:II.2.2

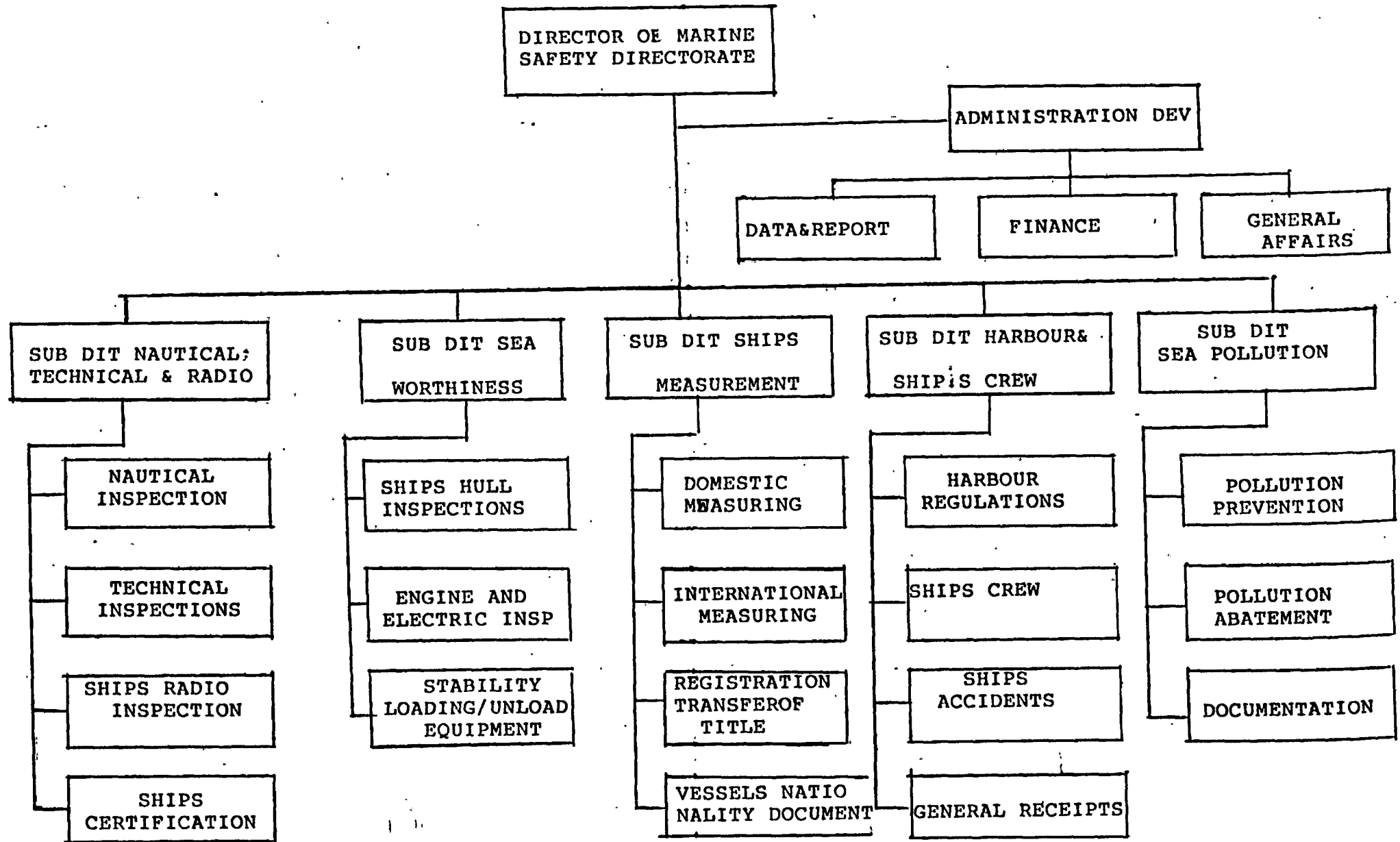


ORGANISATION CHART OF THE MINISTRY OF COMMUNICATION

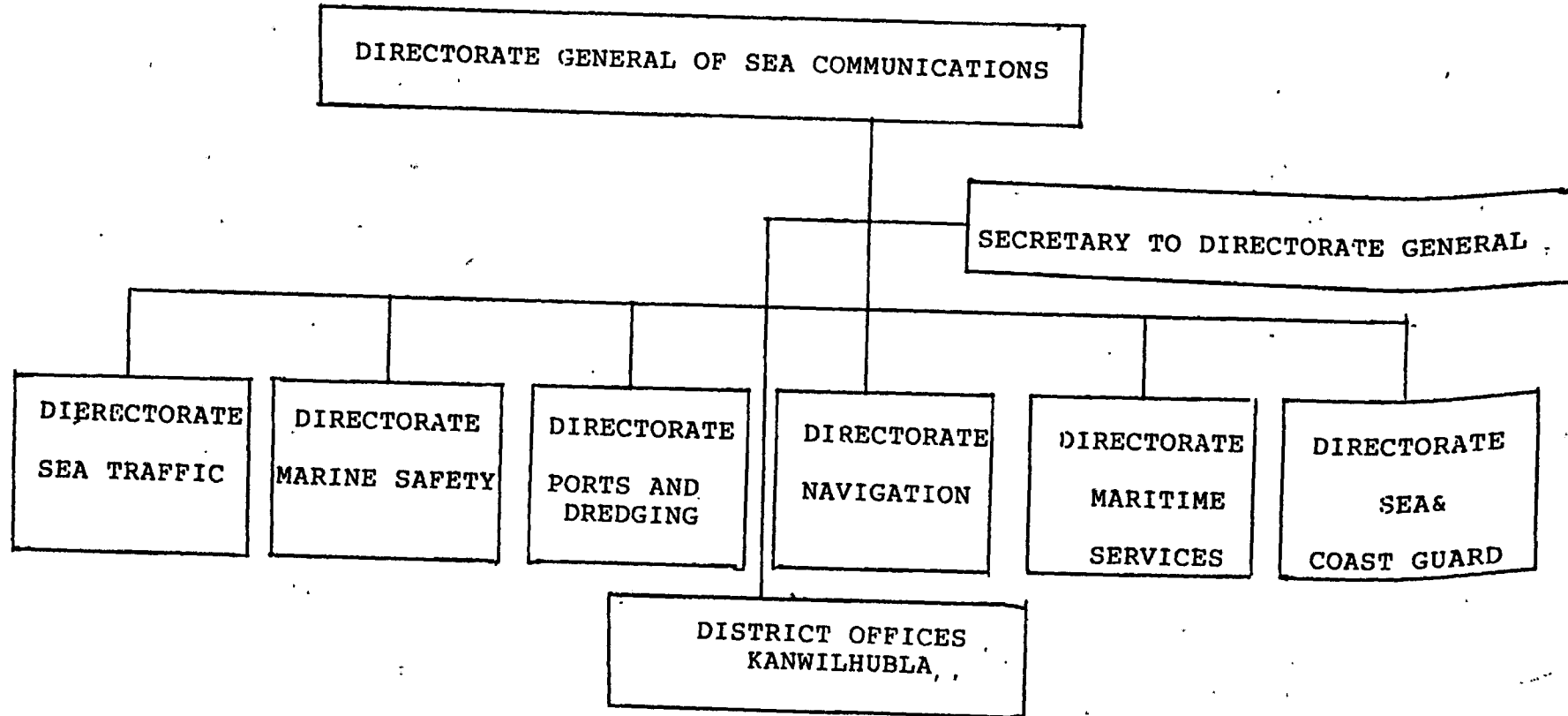


ORGANISATION CHART OF DIRECTORATE OF MARINE SAFETY

Annex:II.1.2

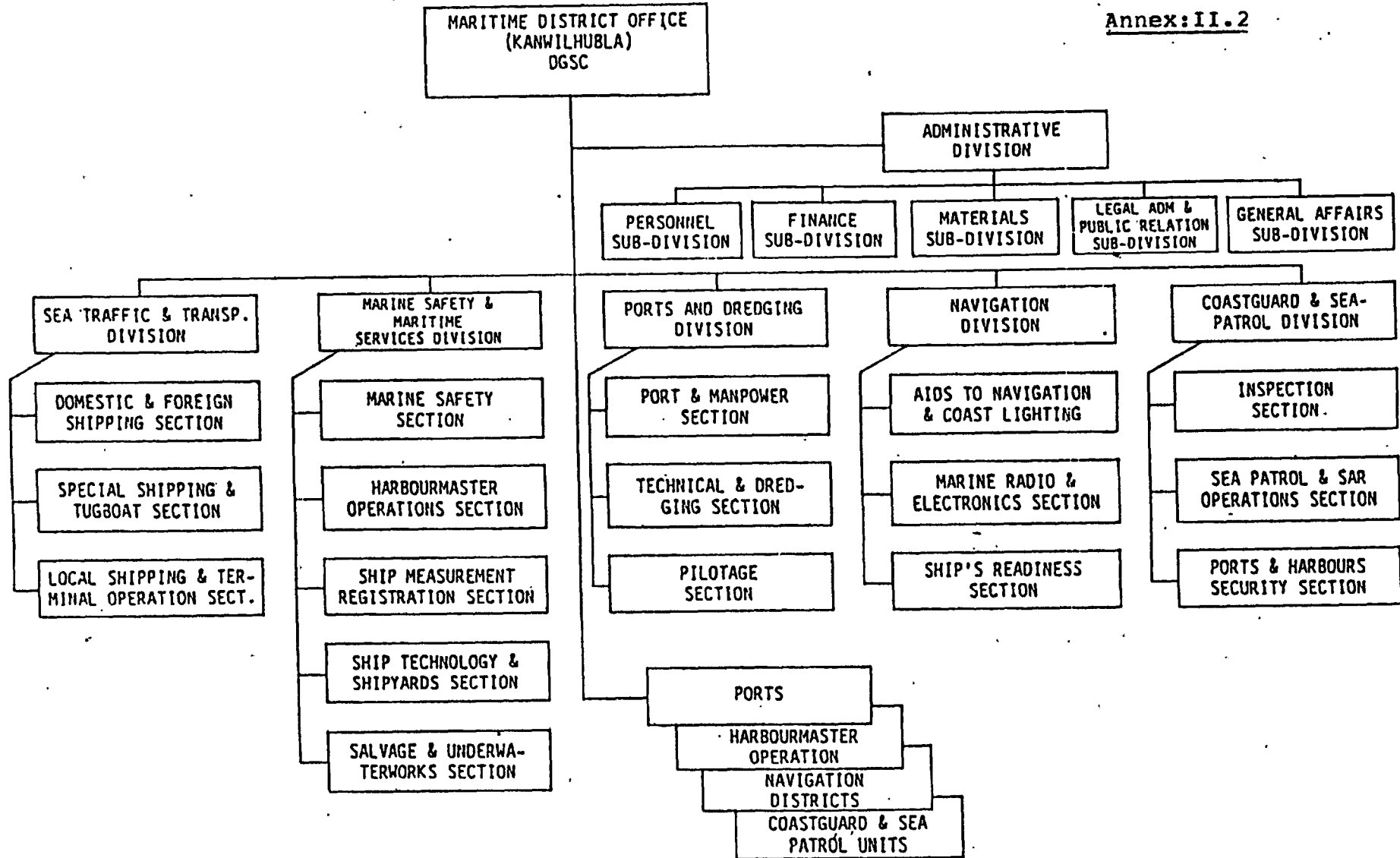


ORGANISATION CHART OF DIRECTORATE OF SEA COMMUNICATION



# ORGANIZATION CHART OF DGSC DISTRICT OFFICE

Annex: II.2



Annex:1.2.1

FORECAST OF POPULATION UP TO YEAR 2.000

Unit:1000 persons

Y E A R	P O P U L A T I O N	Y E A R	P O P U L A T I O N
1985	162.841	1995	190.794
1986	166.098	1994	194.610
1987	169.420	1995	198.502
1988	172.808	1996	202.472
1989	176.264	1997	206.521
1990	179.789	1998	210.651
1991	183.585	1999	214.864
1992	187.053	2000	219.161

SOURCE:STATISTIC INDONESIA 1982



POPULATION IN INDONESIA

PROVINCE	A R E A		POPULATION 1980		POPULATION PER KM2
	SqURE KM	%	X 1.000	%	
SUMATERA	473,606	24.67	28.016	19.00	59
J A W A	132,187	6.89	91.269	61.88	690
NUSATENGARA	88,488	4.61	80.437	5.75	96
KALIMANTAN	539,460	28.10	6.723	4.56	12
SULAWESI	189,216	9.86	10.410	7.06	55
IRIAN JAYA/ MALUKU	496,486	25.87	2.585	1.75	5
T O T A L	1.919.443	100.00	147,490	100.00	77

SOURCE: STATISTIC INDONESIA 1982.

POPULATION BY PROVINCE/ISLAND AND ANNUAL POPULATION GROWTH

NAME OF ISLAND	P O P U L A T I O N			ANNUAL POPULATION GROWTH	
	RATE/%				
	1961	1971	1980	1961-1971	1971-1980
SUMATERA	15.739.365	20.808.148	28.016.160	2.86	3.32
J A W A	63.059.575	76.086.327	91.269.528	1.59	2.82
NUSATENGARA	5.557.656	6.619.074	8.487.117	1.78	2.01
KALIMANTAN	4.101.475	5.154.774	6.723.863	2.34	2.96
SULAWESI	7.079.349	8.526.901	8.675.534	1.90	2.22
IRIAN JAYA/MALUKU	1.547.930	2.013.005	2.584.881	2.69	2.79
T O T A L		11.920.822	14.749.298	2.10	2.32

SOURCE: STATISTIC INDONESIA 1982