



# Introduction to THE PREVENTION OF MARINE POLLUTION FOR SEA TRANSPORTATION

Winarno | Nur Rohmah | Andi Prasetiawan

Translators:  
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# **INTRODUCTION TO THE PREVENTION OF MARINE POLLUTION FOR SEA TRANSPORTATION**

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Politeknik Ilmu Pelayaran Semarang

**PENGANTAR PENCEGAHAN PENCEMARAN LINGKUNGAN MARITIM  
UNTUK TRANSPORTASI LAUT**

[a1]

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# PREFACE

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All praise to Allah SWT, because of His blessings, this book “Introduction to the Prevention of Marine Pollution for Sea Transportation” can be completed. This book was arranged and intended as a reference for marine students in Indonesia. This book is expected to give insight and knowledge to the readers about the importance of preserving the marine environment.

A ship is a means of sea transportation that is very economical and can transport large quantities of cargo. However, there are risks of pollution as the result of garbage or waste dumped at sea from ship operations that can threaten the sea ecosystem.

Sea pollution has a great impact on humans. Therefore, the prevention of pollution at sea must be regulated to ensure the continuity of the biological environment at sea.

This book is compiled as a form of the authors’ concern towards the prevention of marine pollution in order to provide knowledge to the readers about the importance of maintaining marine sustainability.

The authors would like to thank and appreciate all the people involved in the arrangement and completion of this book. The authors hope this book will give a significant contribution to the maritime world. Any critiques and suggestions are welcomed for the betterment of this book in the future.

Semarang, 27 September 2017

Authors



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# CHAPTER I.

## MARINE AND COASTAL POLLUTION

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Marine pollution is defined as the spread of chemical particles; industrial, agricultural, and housing waste; noise, or the spread of invasive organisms into the ocean, which has the potential to cause harm to the environment.

In the case of pollution, many harmful chemicals in the form of small particles are eaten by plankton and other animals, most of which are decomposers or filter feeders (filtering water). In this way, toxins that are concentrated in the sea enter the food chain. The longer the contaminated chain, the greater the level of toxins stored. In many other cases, many of these chemical particles react with oxygen, causing the waters to become anoxic. The majority of marine pollution sources come from land, whether blown by the wind, washed away, or through spills.

Pollutants that spread to the coastal and marine areas can come from a variety of sources. The physical state and the composition of the pollutants can be varied. Thus, the impacts on the environment also vary. For this reason, to understand the pollution that occurs in coastal and marine environments, some issues need to be discussed, including the type of pollutants, their characteristics, the condition around the coast and the sea, and the impacts of the contamination of these pollutants into the environment.

Marine pollution is defined as the presence of dirt or waste of the activity of living things that litter the sea area. The sources of this marine pollution include oil spills, remnants of war ammunition coils, process waste on ships, industrial waste into the sea, oil drilling processes at sea, waste from land transportation through rivers, marine

transportation emissions, and pesticide discharges from the waters. However, the main source of marine pollution is derived from oil spills both from processes on ships, offshore drilling, and due to ship accidents. Pollution from oil spills in the sea is a source of marine pollution that has always been the focus of attention. It is because the impacts will be quickly affected the people living around the coast and can cause significant damage to the living things around the coast.

Marine pollution is the result of waste of the activity of living things that contaminate the sea. There are various sources of pollutants that can damage the sea and can endanger living organisms in the sea. For example, many fish died because their living environment was not suitable. Another example is the pollution that occurred in the estuary of the Porong river which was caused by daily ship activities.

The disposal of sludge into the sea will certainly have an impact on the water ecosystem, especially in the Porong River and Aloo River, endangering the health of the surrounding community and local industry such as shrimp, fish, and salt production. However, a research is needed to obtain better understanding about the risks and to make consideration for the risk management through regular monitoring of water quality and analysis of the monitoring results.

### **1.1. Sources of Marine and Coastal Pollution**

Chemicals in the living environment that can cause damage to human life, animals, and plants are called pollutants. The main sources of pollutants are:

1. Natural processes. They include biological decay, volcanic activity, burning of bushes, and lightning.
2. Human activities. They include: pollution by oil. [A13]

Nowadays, the world's oil industry has grown rapidly. Thus, accidents that result in oil spills on the ocean are inevitable. For example, tankers carry large amounts of crude oil every year. If oil spills on the ocean, the oil will float on the sea surface and eventually be carried away by currents and carried to the coast.



Oil spills, whether intentional or not are a very dangerous source of pollution. Oil spills into the sea can come from tankers that have collided or run aground, or from deliberate processes such as ballast tank cleaning, inter-ship oil transfers, or crew negligence. Generally, oil spills from tankers come from the discharge of ballast water tanks. As an illustration, for a tanker weighing 50,000 tons, the discharge from the ballast tank reaches 1,200 barrels.

Crude oil contains thousands of different components of molecular weight. It is dark brown and is a pungent-smelling viscous liquid, consisting mainly of hydrocarbons, some sulfur content, and a few metals such as vanadium and nickel. Most hydrocarbons have a lighter density than seawater. Thus, most oil spills will float on the surface. The spills floating on the sea surface will cover a large area and will disrupt the life of phytoplankton and other marine animals. In addition, oil spills also harm water birds, as their wings become sticky after having contact with oil.

In the case of an oil spill on the coast of France, only in a few days, more than a million birds died as a result of the pollution. Some hydrocarbons that have a greater density than water will sink, and together with their metal components will settle on the seabed. These deposits will also harm other marine organisms.

When crude oil is heated to 100°C, about 12% of its volume will burn. When heated to 200°C, the amount of burned volume increases by another 13%. As much as 25% is estimated to be a volatile fraction that will evaporate from a spill at sea within days. The rest of the oil spill will be metabolized by bacteria slowly, and some will evaporate slowly as well. After approximately 3 months, all the material that can evaporate will evaporate, and the consumable material will be consumed or enter the food chain. The remaining, which is left on the ocean in the form of asphalt residues, is approximately 15% of the entire volume of oil spills. The remains will continue to exist in the ocean in the form of sticky lumps of deep color.

## 1.2. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Dumping) 1972

*The Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter*, better known as London Dumping, is an International Convention signed on 29 December 1972 and came into force on 30 August 1975. It is an international convention that is an extension of the content of the Stockholm Convention. Basically, this convention broadly discusses the prohibition of deliberate waste disposal in the marine environment. The purpose of this Convention is to protect and preserve the marine environment from all forms of pollution. The participants are obliged to take effective measures, either individually or jointly, in accordance with their scientific, technical, and economic capabilities to prevent, minimize, and if possible, stop pollution caused by the disposal or burning of waste or other hazardous materials in the sea. The protocol participants are also obliged to align their policies with each other.

Definition of dumping based on the 1996 protocol is any storage of waste on the seabed and the seabed layer on ships, aircraft, platforms, and every act of abandonment or destruction just above the platforms just for the purpose of destroying. The exception to this definition is the disposal which in this protocol gets an additional i.e., the act of leaving material (such as cables, pipes, and marine research equipment) in the ocean, which is placed for a purpose other than disposal.

States obligations:

1. The obligation of the participating protocol countries is to apply the precautionary approach principle or a preparedness approach to protect the marine environment from the disposal of waste or other materials.
2. Another obligation is to implement the polluters pays principle that states polluters must bear the cost of pollution.

3. The next obligation is not to transfer, either directly or indirectly, damage to another environmental area or change one form of pollution to another.
4. The participating protocol countries are also obliged to prohibit the disposal of any waste or other toxic materials with the exceptions listed in annex 1 where permission for the disposal must be obtained in advance.
5. The participating countries shall also apply administrative or legal requirements to ensure that the issuance of such permits and licensing terms is in accordance with those stipulated in annex 2 of this 1996 protocol. In addition, the practice of burning waste or other materials to other countries for their disposal or burning is included in this protocol and participating countries shall prohibit it. Exceptions to the prohibitions stipulated in this protocol are the necessity to obtain permits and burning at sea in an emergency due to pressure or weather, or in the event that there is a threat of danger to the human life and disposal is the only way to avoid such threats.

Participating countries shall appoint a body or an agency to handle licensing; make records of the nature and amount of waste or other materials and the nature of the waste or other materials that have actually been disposed, the location, time and manner of their disposal. The agency also conducts individual monitoring or in cooperation with other participating countries.

6. The participating countries shall also take several measures, among others:
  - a. Preventing and punishing any actions that violate this protocol.
  - b. Ensuring, that through proper implementation, the owned vessels and aircraft are operated in such a way that does not conflict with this protocol.

Precautions and guarantees of the appropriate implementation are imposed on ships and aircraft that:

1. Registered in the flying region or flying with the flag of the country.

2. Transporting on its territory, waste or other materials that are disposed of or burned at sea.
3. Carrying out disposal or burning in the sea including platforms.

The exception to the enforceability of this protocol is for ships and aircraft entitled to a country's immunity under international law and that only that country can apply the provisions to the vessels and aircraft in question.

In the implementation of this protocol, participating countries hold consultative meetings to implement provisions against the ships and aircraft in question.

In the implementation of this protocol, participating countries hold consultative meetings to establish the necessary procedures and mechanisms to evaluate and encourage obedience to the provisions of this protocol.

From the recommendation of the meeting, the procedures and mechanisms of implementation are made. These are including the cooperation in its implementation, including cooperation with non-participating countries. For the implementation of this protocol, then in a regional area that has similar geographies and has the same interest in the prevention or even the ban of pollution due to the disposal or burning of waste or other materials that can result in environmental damage, regional agreements are made and also to harmonize with different conventions but relevant with this protocol.

### **International Convention for the Prevention of Pollution from Ships 1973/1978 (MARPOL 1973/1978).**

Marpol is an international regulation aimed at preventing pollution at sea. Every system and equipment on the ship that supports this regulation must be certified by the class. Marpol does not prohibit the disposal of pollutants into the sea but regulates the way of disposal. It is to prevent sea pollution and maintain the sea ecosystem.

Marpol contains 6 (six) Annexes containing regulations regarding the prevention of pollution from ships on:

1. Annex I – Oil.
2. Annex II – Noxious Liquid Substance Carried in Bulk (Nox liquid bulk-shaped).
3. Annex III- Harmful Substance in Packages Form (dangerous goods in packaging).
4. Annex IV – Sewage (dirty water/disposal water).
5. Annex V – Garbage.
6. Annex VI – Air Pollution.

### 1.3. Introduction to MARPOL 73/78

Speaking of pollution at sea, this is an issue that is closely related to the daily life of seafarers. If the seafarers are negligent and there are oil spills at sea, the impact is very significant. Not only is the marine biota environment threatened, but the seafarers have to face the law in the territorial waters of the country. Therefore, it is important to avoid mistakes and run good management on board, such as keeping the oil record books up-to-date and the waste management system controlled. Many seafarers sometimes take this for granted. To avoid the problem, we need to understand and explore MARPOL. This section will give a description of MARPOL.

Since the launch of the first oil tanker, the GLUCKAUF, in 1885 and the first use of diesel engines as the ship's main propulsion three years later, the phenomenon of marine pollution by oil began to emerge.

It was not until 1954, on the initiative and organization carried out by the British Government (UK), that the "*Oil Pollution Convention*" was born, which sought ways to prevent the disposal of oil mixtures and the operation of tankers and other ship engine rooms.

As a result, it was the IMO "*International Conference on Marine Pollution*" from October 8 to November 2, 1973 which resulted in the "*International Convention for the Prevention of Oil Pollution from Ships*" in 1973, which was later refined with the TSP (Tanker Safety and Pollution Prevention) Protocol of 1978 and this convention known as MARPOL 1973/1978 which is still in force until now.

The definition of "Ship" in MARPOL 73/78 is as follows:

*"Ship means a vessel of any type whatsoever operating in the marine environment and includes hydrofoil boats, air cushion vehicles, submersibles, fixating Craft and fixed or floating platform".*

Thus, "Ship" in the maritime environmental protection regulation is defined as any type of building that resides in the sea whether it is floating or embedded fixed on the seabed.

#### **1.4. Definition of Pollution Prevention**

Pollution is the spread of pollutants such as chemicals, sounds, heat, light and energy into the environment which results in devastation and danger for human health, threatens natural resources and ecosystems, and disrupts the environment.

A more detailed definition of pollution according to the Environmental Quality Act 1974 is a direct or indirect change to the physical, chemical, biological or radiation properties of the surrounding natural parts by releasing, removing or putting waste to cause a dangerous state or may be harmful to the health, safety or sustainability of other organisms, plants and animals.

Pollution prevention is the use of materials, processes, or practices that reduce or eliminate waste or its sources. It also aims to protect natural resources.

#### **1.5. Pollution Prevention Goals**

This pollution prevention program aims to reduce all waste that comes from products. An effective pollution prevention program will be able to:

1. Reduce the risk of criminal and civil charges.
2. Reduce operational costs.
3. Develop employees' participation and character.
4. Improve the company's reputation.
5. Protect public health and the environment.
6. Maintain the preservation of the marine environment.

7. Protect marine ecosystem.
8. Prevent spills of oil or other materials into the sea that can cause pollution and harm the marine environment.
9. Keeping the marine environment stable and clean.





# CHAPTER II.

## DEFINITION OF POLLUTION

---

### 2.1. Definition of Pollution

Pollution is the entry or inclusion of substances of industrial, agriculture, and residential waste into the marine environment by human activities/natural processes either directly or indirectly. Pollution can have a great impact on the condition of the marine environment, and cause pollution and death of marine organisms. Because of pollution, the environment cannot function optimally anymore according to its designation.

### 2.2. Materials That Cause Pollution

Pollutants originating from the ship can come from cargo loaded on the ship, fuel used for propulsion, and other equipment on board. They can also come from the results of other activities on board, such as garbage and sewage.

The definition of pollutants as referred to on MARPOL 73/78 is as follows:

1. "Oil" is all types of petroleum such as crude oil (*refined product*), fuel (*fuel oil*), oil impurities (*sludge*) and refined oil.
2. "*Noxious liquid substances*" are toxic and dangerous liquid resulting from chemical products transported by special tankers (*chemical tankers*).

The chemicals are divided into 4 categories (A, B, C, and D) based on the degree of toxicity and their level of danger.

**Category A (X):** Very dangerous (major hazard). This category includes the residue that comes from the cargo tank cleaning and ballast water tank. Thus, they should not be discharged into the sea.

**Category B (Y):** Moderate Hazard. If the chemicals are spilled into the sea, special handling (special antipollution measures) will be required.

**Category C (Z):** Less dangerous (minor hazard). Special assistance is needed to handle these chemicals.

**Category D (OS):** Not harmful. The chemicals in this category require a little attention in handling.

1. **"Harmful substances"** are items that are packed and can endanger the environment if they fall and contaminate the sea.
2. **"Sewage"** is waste from toilets, urinals, treatment rooms, animal feces as well as mixtures of such discharges.
3. **"Garbage"** is material in the form of leftover goods or materials resulting from activities on board or other normal activities on board the ship.

### 2.3. Development of International Regulations on Pollution Prevention

Based on the regulations on the prevention of pollution by oil (annex 1), each ship must be equipped with the following equipment:

1. *Oil record book*  
The oil record book is a ship's record of all oil-related activities. Starting from the process of discharging cargo, discharging slop tank, cleaning cargo tank, and so on. Any form of records should always be ready on board, in case there are periodic checks or local checks.
2. *Oil discharge monitoring system*  
It is a system that controls the level of oil in the water that will be discharged into the sea. The monitoring system must function properly in various environmental conditions to monitor and control

all kinds of oil discharges into the sea. Any discharge from dirty ballast water and all kinds of mixed oil-water from cargo tanks into the sea that are not controlled by the monitoring system is a form of violation. This monitoring system consists of:

- a. Oil meter to measure oil level in the water
- b. Ship speed indicator to find out the speed of the ship (in knots)
- c. Ship position indicator to find out the position of the ship
- d. Discharge control to regulate oil disposal
- e. Data recorder to record data at discharge time
- f. Display data to show data when discharge is in progress.

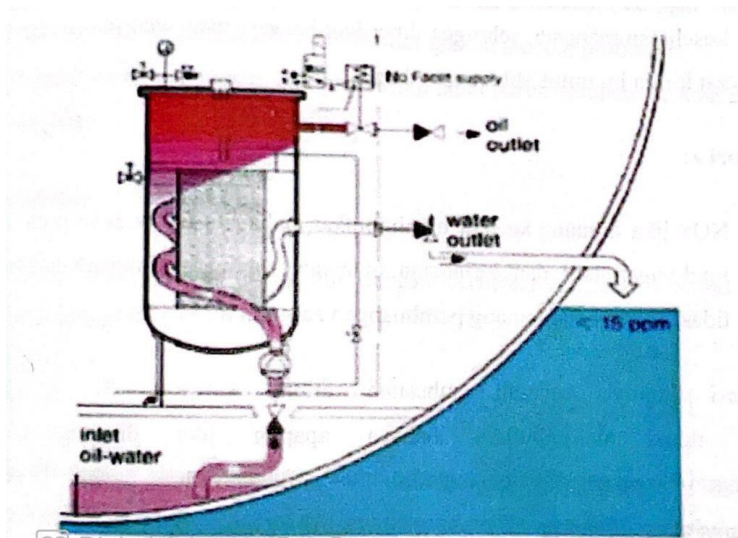


Figure 1. Oil discharge system

The system is connected to an alarm that will ring and automatically close the drain if the oil-water mixed released exceeds 30 liters per nautical mile and the discharged oil content exceeds 15 ppm (part per million).

### Regulation on pollution prevention by NO<sub>x</sub> liquid (annex II).

The categories of chemicals referred to in this annex are:

**Category X:** NO<sub>x</sub> if discharged into the sea is considered to pose the highest level of danger to the marine environment, and human health. Therefore, the disposal of this type of chemical substance is prohibited.

**Kategori Y:** Discharging NO<sub>x</sub> into the sea can endanger the marine environment and human health. Thus, limits are set regarding the amount and level of these chemicals to be discharged into the sea.

**Category Z:** Discharging NO<sub>x</sub> into the sea can cause a relatively small danger to the marine environment and human health. Thus, less strict restrictions on the disposal of this substance into the sea is applied.

Other substances are substances outside the X, Y, and Z categories because they do not pose any danger if discharged into the sea.

**Regulation on the prevention of pollution by hazardous goods carried in packaging form (annex III).**

The hazardous substances and packaging in this part are substances that fall under the criteria of the IMDG (International Maritime Dangerous Good) Code. This regulation is intended to prevent the occurrence of marine pollution by goods that have dangerous properties (both physically and chemically) that need to get special treatment.

To implement the rule, several procedures must be carried out:

**Packing:** Packaging should be sufficient to minimize the dangers that may affect the environment.

**Marking and labeling:** Packaging containing hazardous substances must be equipped with detailed information and attached with a marine pollutant label. Materials for marking and labeling must last for 3 months of sailing.

**Documentation:** All goods must be equipped with certificates as inspection materials.

**Stowage:** All dangerous goods must be stowed safely to prevent pollution to the marine environment by not endangering the ship and its passengers.

**Quantity limitations:** Limiting the amount of substance that could endanger the marine environment.

**Regulation on the prevention of pollution by garbage (Annex V).**

Garbage can be classified as follows:

1. Plastic (synthetic rope, nets, plastic bags, etc.)
2. Mixed garbage
3. Food waste
4. Paper, cloth, glass, metal

Implementation of regulation:

1. Placards installation

Any ship more than 12 meters in length should be equipped with placards as a warning to the crew about the garbage disposal requirement.

2. Ship garbage management plan

Any ship above 400 tons of GT and vessels with a crew capacity of 15 people or more must have a garbage management plan that all crew members adhere to.

This includes the separation of garbage according to its type, and the installation of treatment facilities for garbage, for example, incinerators.

3. Ship garbage record book

Any ship above 400 tons of GT and vessels with a crew capacity of 15 people or more must show the garbage record book to the port authority when berthing.



# CHAPTER III.

## MARPOL CONVENTION

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### 3.1. The International Convention on Oil Pollution Preparedness Response and Cooperation 1990 (OPRC)

OPRC is an international convention to overcome pollution that occurs due to oil spills and dangerous toxic goods. In the convention, it is stated that in the event of an accident and pollution, appropriate action shall be taken immediately to overcome it. This depends on cooperation between emergency management plans on board ships, offshore oil rig platforms, and ports as well as the loading and unloading facilities, together with national and regional emergency management plans. This Convention deals with the issue of preparation and action or response to oil pollution in all forms including toxic and dangerous goods that threaten the preservation of the marine environment.

The regulations in the OPRC are intended as an effort to prevent and overcome oil spills, especially oil spills on a large scale. In the introduction of this convention, it is mentioned that "in the event of an oil pollution incident, prompt and effective action is essential in order to minimize the damage which may result from such an incident". In the event of an oil spill, immediate and effective action is needed. This action is important to minimize the damage caused by an oil spill, including actions that can be allowed in the national system within a country. The convention states that "Each Party shall establish a national system for responding promptly and effectively to oil pollution incidents".

Therefore, countries can implement the convention in their national system as an effort to overcome oil spills immediately and effectively.

The Convention also states that "each Party, within its capabilities either individually or through bilateral or multilateral cooperation and, as appropriate, in cooperation with the oil and shipping industries, port authorities and other relevant entities". The statement indicates that efforts to overcome oil spills can be more successful if countries can establish cooperation (whether individually, bilaterally, or multilaterally) with the petroleum industry, shipping industry, port officials, and other relevant agencies.

The outline of this convention is:

1. *International Cooperation and Mutual Assistance* - International Cooperation in order to help each other  
Member states agree to cooperate and assist each other who ask for assistance in tackling pollution that occurs, provided that they have sufficient ability and means, and the party requesting assistance must pay to the party who helps, at a cost in accordance with the assistance provided. Developing countries will be given payment waivers.
2. *Pollution Reporting*  
Member states agree that ships, offshore units, aircraft, ports and other loading and unloading facilities will report all pollution occurring to a country's nearest coast or to the port authorities of nearby neighboring countries, and notify neighboring countries, including the *International Maritime Organization (IMO)*.
3. *Oil Pollution Emergency Plans* – Oil Pollution Management Plan is intended for:
  - a. Tankers with 150 GT in size or more, and other types of vessels with 400 GRT in size or more.
  - b. All installed platforms or floating offshore structures used in oil and gas operations, exploration, production, and loading and unloading activities.
  - c. All ports and loading and unloading facilities that have a risk of causing pollution.



#### 4. National And Regional Preparedness and Response Capability – Countermeasure Readiness

In both national and regional pollution cases, a convention requires the establishment of a national system to immediately address the pollution that occurs. This includes the minimum basis for the establishment of the National Contingency Plan, the determination of authorized national officers, and the person in charge of pollution management operations for the preparation and implementation, reporting, and requests for assistance needed.

Each member, whether individually or through cooperation with other countries, or with industry must prepare:

- a. Pollution prevention minimum equipment, which is proportional to the expected risk and its program
- b. The organization's training program for pollution management and training plans for some personnel.
- c. A detailed plan and willingness to communicate to deal with pollution management.

An accident management coordination plan includes the ability to mobilize the necessary facilities.

#### 5. Technical Cooperation and Transfer of Technology

Cooperation between members in the field of engineering and training in order to use and utilize the available facilities and equipment to overcome pollution. In addition, members can actively cooperate in technology transfer.

#### 6. Research and Development

Direct cooperation or through the IMO to conduct regular international symposiums to exchange new experiences and discoveries of countermeasures; equipment used and the results of research conducted; monitoring technologies and techniques; shelters; dispersion used; cleaning and recovery.

## 7. International Arrangement and Support

The IMO is responsible for the following activities:

- a. Spreading Information
- b. Education and Training
- c. Technical assistance

In this convention, the principles used are the precautionary principle, prevention principle, polluters pay principle, Cooperation and assistance, and strict liability.

### **3.2. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (London Dumping Convention)**

This Convention is a process of an accumulation from the international community to prevent dumping. Article 1 of the London Convention states that:

*Contracting Parties shall individually and collectively promote the effective control of all sources of pollution of the marine environment, and pledge themselves, especially to take all practicable steps to prevent the pollution of the sea by the dumping of waste and other matter that 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.*

Participating countries are obliged, both individually and jointly, to develop effective supervision of all sources of pollution that may pollute the marine environment. Countries are also required to take concrete action to prevent the occurrence of marine environmental pollution caused by dumping, and other problems that could endanger human health, harm the lives of natural resources and the marine environment and undermine comfort over legitimate use of the sea. The London Convention regulates in detail the substances that are prohibited for disposal. Some substances that are prohibited to be disposed of by any method are organohalogen compounds, mercury, cadmium, plastics,

and other non-perishable synthetic materials, crude oil and its waste, petroleum refinery products, petroleum, residual petroleum residues, and mixtures of components such as radioactive materials (solids, liquids, semi-liquids, gases and in living media used for biological and chemical warfare). Participating countries are also required to take immediate action to prevent and punish polluters. [2][AI4][a5]

In 1996 a protocol was issued as a response to the London Convention, in which there was an important change in the "*precautionary approach*". The exception to the dumping permission is if it is caused by the presence of "*cases of force majeure*" or circumstances that endanger human life, or circumstances that clearly threaten the safety of the ship. [3][AI6][a7]

In this convention, the principles used are the *rights to explore without causing harm principle, precautionary principle, effective control principle, prevention principle, polluters pay principle, and the responsibility of states.*

### **3.3. International Convention for the Prevention of Pollution from Ships 1973 (Marine Pollution) MARPOL 1973/1978**

*The International Convention for the Prevention of Pollution from Ships 1973* was later amended with the 1978 Protocol and this convention was known as MARPOL 1973/1978. MARPOL 1973/1978 contains 6 (six) Annexes containing regulations regarding the prevention of pollution from ships, including:

1. **Annex I** Pollution by Oil entered into force on October 2, 1983
2. **Annex II** Pollution by Noxious Liquid Substances in bulk came into force on April 6, 1987.
3. **Annex III** Pollution by Harmful Substances in packaged form came into force on July 1, 1991
4. **Annex IV** Pollution by Sewage from ships, enacted September 27, 2003

5. **Annex V** Pollution by garbage from ships entered into force on December 31, 1988
6. **Annex VI** Air pollution from ships. This type of pollution has not been entered into force. Only Annex I and Annex II which have been ratified by the Government of Indonesia with the issue of Presidential Decree No. 46 of 1986.

### **3.4. United Nations Convention on the Law of the Sea 1982 (UNCLOS)**

The Convention on the Law of the Sea 1982 fully regulates *the protection and preservation of the marine environment* contained in Articles 192-237. Article 192 states that every country has an obligation to protect and preserve the marine environment. Article 193 outlines an important principle in the use of resources in the marine environment which says that every state has the sovereign right to exploit its natural resources in accordance with its environmental policies and in accordance with its obligation to protect and preserve the marine environment.

#### **3.4.1. Country Obligations**

The Convention on the Law of the Sea of 1982 calls on each country to make efforts to prevent, reduce, and control pollution of the marine environment from any source of pollution, such as pollution from the disposal of hazardous and toxic wastes derived from land-based sources, dumping from ships, and exploration and exploitation installations. In the efforts to prevent, reduce, and control environmental pollution, each State shall cooperate in both regional and global cooperation as stipulated by Article 197-201 of the Convention on the Law of the Sea 1982.

States parties to the Convention on the Law of the Sea 1982 have an obligation to comply with all the provisions of the Convention with respect to the protection and preservation of the marine environment, namely as follows:

1. The obligation to make laws and regulations on the protection and preservation of the marine environment that regulate comprehensively including the management of pollution of the marine environment from various sources of pollution, such as pollution from land, ships, dumping, etc. The regulations shall include the enforcement of the law and the court process.
2. The obligation to make efforts to prevent, reduce and control pollution of the marine environment.
3. The obligation to carry out regional and global cooperation. Regional cooperation means cooperation at the level of ASEAN member states. Global cooperation means cooperation with other countries outside ASEAN. Nowadays the issue of pollution of the marine environment is a global problem, thereby the handling must be global as well.
4. States must have regulations and equipment as part of contingency plans.
5. The laws and regulations are accompanied by a process of accountability mechanisms and compensation obligations for parties affected by marine pollution.

#### **3.4.2. Regional and International Cooperation**

In carrying out the obligation to protect and preserve the marine environment, each country is required to cooperate both regionally and globally. The necessity for regional and global cooperation (*global and regional cooperation*) is regulated by Article 197-201 of the Convention on the Law of the Sea 1982. Article 197 of the Convention states: "States shall cooperate globally and regionally directly or through international organizations in formulating and explaining international regulations and standards and recommended procedures and practices in accordance with the Convention for the protection and preservation of the marine environment with due regard to such regional circumstances".

Regional and global cooperation can be in the form of cooperation in notification of marine pollution, joint countermeasures of hazards for

the occurrence of marine pollution, establishment of *contingency plans against pollution*, studies, research, exchange of information and data; and create scientific criteria to regulate procedures and practices for the prevention, reduction, and control of pollution of the marine environment as affirmed by Article 198-201 of the Convention on the Law of the Sea 1982. In addition, Article 207-212 of the Convention on the Law of the Sea 1982 requires each country to make laws and regulations governing the prevention and control of marine pollution from various sources of pollution, such as land-based sources, pollution from seabed activities to national *jurisdiction*, *pollution from activities in the Area*, *pollution by dumping*, *pollution from vessels*, and *pollution from or through the atmosphere*.

### 3.4.3. Obligation and Liability of Indemnity

The Convention on the Law of the Sea 1982 regulates the issue of obligation and liability of indemnity with respect to the protection and preservation of the marine environment. Article 235 of the Convention affirms that each State is responsible for carrying out its international obligations regarding the protection and preservation of the marine environment so that all States shall assume the obligation of redress in accordance with international law.

Each State shall have laws and regulations on immediate and adequate compensation for losses (*damages*) caused by pollution of the marine environment by persons (*natural persons*) or *juridical persons* who are in its jurisdiction. Therefore, each State shall cooperate in implementing international law governing the obligation and liability of the indemnity for compensation for losses due to pollution of the marine environment, as well as its payment procedures such as whether in the presence of compulsory insurance or compensation funds.

The obligation and liability of indemnity from the State or so-called state sovereignty is a fundamental principle in international law so that in the event of a violation of international obligations will arise the responsibility of the State. Violations of international obligations such as

not implementing the provisions contained in the Convention on the Law of the Sea 1982 which has been binding on its country. There is no treaty that specifically regulates the responsibilities of States in international law. So far, the issue of State responsibility refers to the Draft Articles on Responsibility of States for International Wrongful Acts made by the International Law Commission of the UN General Assembly.

### **3.5. International Conventions on Civil Liability for Oil Pollution Damage 1969 (Civil Liability Convention)**

International Convention on Civil Liability for Oil Pollution Damage or the CLC 1969 is a convention governing the compensation of marine pollution by oil due to tanker accidents. This Convention applies to pollution of the marine environment in the territorial seas of State parties. In terms of liability for compensation for pollution of the marine environment, the principle used is the principle of strict liability. [4]

#### **3.5.1. Scope of Application**

The application of this convention is on the damage to the pollution of spilled crude oil (persistent oil) and the cargo of tanker. The Convention covers damage to site pollution including the waters of member states of the Convention on The Flag State of ships and the nationality of tank ship owners not covered by the application level and CLC Convention. Notation of "pollution damage", including efforts to prevent or reduce damage due to pollution in the territorial areas of member states of the Convention (*Preventive measures*).

This Convention applies only to damage caused by spills of oil cargo from tankers and does not include oil spills that are not cargo or pure deterrence efforts made where no oil is spilled from tankers at all. This Convention also applies only to ships that transport oil as cargo, namely oil transport tankers. Spills from tankers in the voyage "*Ballast Condition*" and spills from oil bunkers or vessels other than tankers are not included in this convention. Damage caused by "*Non-persistent Oil*"

such as gasoline, kerosene, light diesel oil, etc., is also not included in the CLC *Convention*.

### 3.5.2. Strict Liability

The shipowners have an obligation to compensate for pollution damage caused by oil spills and the ships due to accidents. The owner can be free from these obligations only on the grounds of:

1. Damage as a result of war or natural disasters
2. Damage as a result and sabotage of the other party, or
3. Damage caused by the authorities not maintaining navigation aids properly.

The reasons for the above exclusion are very limited, and the owner can be said to be obliged to provide compensation due to pollution damages in almost all accidents that occur.

### 3.5.3. Indemnity Liability Limits (Limitation of Liability)

Under certain conditions, the ship's owner compensates indemnity with a limit of 133 SDRs (*Special Drawing Rights*) per ton of the ship's tonnage or 14 million SDRs, or approximately US\$19.3 million taken smaller ones. If the claimant can prove that the accident occurred due to a personal error (*actual fault of privity*) from the owner, then the limit of compensation (limit his liability) for the ship owner is not given.

### 3.5.4. Indemnity Request (*Channeling of Liability*)

Claims against pollution damages under the CLC Convention can only be shown to registered shipowners. This does not preclude victims from claiming compensation for damages outside this convention from anyone other than the ship's owner. Nevertheless, the convention prohibits making claims to representatives or agents of the shipowner. The ship owner must address the issue of claims from third parties under applicable national law.



### **3.6. The Basel Convention on Control of Transboundary Movements of Hazardous Wastes and Their Disposal 1989**

International agreements have been made to discuss the movement of B3 waste, (including those produced by ships) in The Basel Convention. The convention addresses the movement of hazardous waste across countries signed by more than 100 countries. The agreements produced in this convention are:

1. Reduce the production of hazardous waste.
2. Reduce cross-border displacement (transboundary) hazardous waste.
3. Waste disposal is as close to where it is produced.

The Convention also issues principles that must be carried out regarding polluters:

1. The “polluter pays” principle:  
Polluters are legally and financially responsible for safe, environmentally friendly waste handling and provide incentives to avoid waste.
2. The “precautionary” principle:  
This is the principle regarding health protection and safety issues.
3. The “duty of care” principle:  
Waste producers are responsible for safely disposing of waste.
4. The “proximity” principle:  
Processing and disposal should be attempted as closely as possible to the source where the waste is produced.



# CHAPTER IV.

## MARPOL CONVENTION (6 ANNEX)

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*The International Convention for the Prevention of Pollution from Ships 1973* was later amended with the Protocol in 1978 and this convention was known as MARPOL 1973/1978. MARPOL 1973/1978 contains 6 (six) Annexes containing regulations regarding the prevention of pollution from ships.

1. **Annex 1: *Prevention of pollution by oil*** (2 October 1983)

Total hydrocarbons (oily waters, crude, bilge water, used oils, etc.) that are allowed to be discharged into the sea by a ship should not exceed 1/15000 of the total ship's cargo. In addition, waste disposal should not exceed 60 liters per mile of ship travel and is calculated after the ship is more than 50 miles from the nearest coast. The Ship Register must contain a list of the types of waste carried/produced and the amount of oil waste that is produced. The ship Register must be reported to port officials.

2. **Annex II: *Control of pollution by noxious liquid substances*** (6 April 1987)

This rule contains about 250 types of goods that should not be discharged into the sea, can only be stored and further processed when they arrive at the port. It is banned for the disposal of waste within 12 nautical miles of the nearest waterfront.

3. **Annex III: *Prevention of pollution by harmful substances in packaged form*** (1 July 1992)

This additional rule is not implemented by all countries, namely the standard rules for packaging, labeling, storage methods and documentation of hazardous waste produced by ships while sailing.

4. **Annex IV: Prevention of pollution by sewage from ships** (27 September 2003)

This rule is specific to special waters and contamination rules that are acceptable at certain levels (restrictions). Germ-killing fluids (disinfectants) can be discharged into the sea more than 4 nautical miles from the nearest beach. Untreated wastewater can be discharged into the sea at a distance of more than 12 nautical miles from the nearest coast on the condition that the ship sails at a speed of 4 knots.

5. **Annex V: Prevention of pollution by garbage from ships** (31 December 1988)

This regulation prohibits the dumping of plastic waste into the sea.

6. **Annex VI: Prevention of air pollution by ships**

This rule cannot be effectively implemented because there are not enough countries that ratified (sign agreements) it.

MARPOL 1973/1978 contains regulations to prevent oil pollution into the sea. However, then in 1984, some modifications were made that highlighted prevention only on the operation of tankers in Annex I and especially the necessity of ships to be equipped with *Oily Water Separating Equipment and Oil Discharge Monitoring Systems*.

Therefore, the MARPOL regulation 1973/1978 can be divided into 3 (three) categories:

1. Regulations to prevent pollution
2. Rules to overcome pollution
3. Regulations for implementing these provisions.

The general obligations of States are stated in Article 1:

*The Parties to the Convention undertake to give effect to the provisions of the present Convention and those Annexes thereto by which they are bound, in order to prevent the pollution of the marine environment by the discharge of harmful substances or effluents containing such substances in contravention of the present Convention.*

This means that state parties of the convention have an obligation to implement the preventive principle, especially regarding oil, which can pollute the marine environment.



# CHAPTER V.

## OIL DISPOSAL (ANNEX I)

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### 5.1. Oil Disposal Requirements

Annex I applies to vessels affected by MARPOL enforcement rules 73/78. The disposal of oil into the sea is prohibited in some designated places and is strictly prohibited in certain areas.

All vessels are required to meet certain devices and adequate shipbuilding standards and provide an oil record book. With the exception of small vessels, a survey must be conducted and for ships sailing in international waters, a certificate of the specified format is strictly necessary.

The port is required to provide adequate reception facilities for oily mixtures and oil residues to serve the ships using the port's services.

The following are the standard requirements requested until the validity of this Annex 6 July 1993 in outline for all types and sizes of vessels referred to in Annex I.

### 5.2. Oil Disposal Supervision

The disposal of oil residues or oil mixtures from vessels into the sea is prohibited unless:

1. Tankers
  - a. Not located in *special areas* (Mediterranean Sea, Baltic Sea, Black Sea, Red Sea, Bay of Aden).
  - b. The distance from the coast is more than 50 miles.
  - c. Disposal is carried out at the time of sailing.

- d. Not disposing of more than 30 liters/nautical mile.
  - e. Not disposing of more than 1/30,000 of the total cargo.
  - f. Equipped with Oil Discharge Monitoring (ODM) and control system, and slop tank structuring.
2. Other ships with more than 400 GRT
- a. Not located in *special areas* (Mediterranean Sea, Baltic Sea, Black Sea, Red Sea, bay of Aden).
  - b. Distance from the beach is more than 50 miles.
  - c. Disposal is carried out at the time of sailing.
  - d. Not disposing of more than 30 liters/nautical mile.
  - e. Not disposing of more than 1/30,000 of the cargo.
  - f. Equipped with Oil Discharge Monitoring (ODM) and control system, and slop tank structuring.

*On freighters of more than 400 GT, equipment and arrangements related to the supervision of oil disposal from the machinery room must be installed, including:*

1. Oil-water separator.
2. Associated piping and pumping system.
3. Standard discharge connection.
4. Tanks with sufficient capacity to hold oil residues (oil sludge deposits).

### **5.3. Oil Disposal Restrictions**

MARPOL 1973/1978 also continues the provisions of the results of the 1954 Convention on Oil Pollution 1954 by expanding the definition of 'oil' in all forms including crude oil, refined oil, sludge (oil impurities), or oil mixtures with other impurities and fuel oil, but excluding petrochemical products (Annex II). Provisions of Annex I Reg. 9 mention that the disposal of oil or oil mixtures is only allowed when:

1. Not within the "Special Area" such as the Mediterranean Sea, Baltic Sea, Black Sea, Red Sea, and Gulf areas.



2. The dump site is more than 50 nautical miles and land.
3. Disposal is done while the ship is sailing
4. Not disposing of more than 30 liters of oil/nautical mile
5. Not disposing of greater than 1: 30,000 of the total cargo
6. All tankers must be equipped with Oil Discharge Monitoring or ODM with their system control.
7. In addition, member state governments are required to issue regulations so that loading ports, shipyards, and all ports where tankers dispose of residue or oil mixtures must be equipped with onshore holding tanks.

#### **5.4. Monitoring and Control of Oil Disposal**

MARPOL Regulation 73/78 Annex I Reg. 16 mentions that:

1. Vessels sized 400 GRT or more but smaller than 1,000 GRT must be equipped with *Oil-Water Separating Equipment* that can guarantee the discharge of oil into the sea after going through the system with oil content less than 100 parts per million (100 ppm).
2. Ships of size 10,000 GRT or more must be equipped with: Combination of Oil-Water Separating Equipment with *Oil Discharge Monitoring and Control Systems*, or equipped with *Oil Filtering Equipment* that can regulate the discharge of sea oil mixtures of no more than 15 parts per million (alarms will ring when exceeding that size).

#### **5.5. Oil Disposal Method**

According to the results of the IMO evaluation, the best way to reduce oil disposal as a result of ship operation activity is to equip the ship with at least one from these three prevention systems:

1. Segregated Ballast Tanks (SBT)
2. Dedicated Clean Ballast Tanks (CBT)
3. Crude Oil Washing (COW)

MARPOL 1973/1978 which was officially enacted internationally on October 2, 1983, mentions:

"All new-built *Crude Oil* tankers size of 20,000 DWT or more and Product tankers size 30,000 DWT or more must be equipped with SBT, and *Crude Oil* tankers size of 20,000 DWT or more must be equipped with COW" (Reg. 13)

What is meant by new-built tankers here is:

1. The construction contract was signed after June 1, 1979.
2. The first construction after January 1, 1980
3. Handover after June 1, 1982

Tankers that choose CBT and COW as a substitute for SBT are required to meet additional requirements, namely providing operating procedures using CBT or COW, and must meet the requirements as specified.

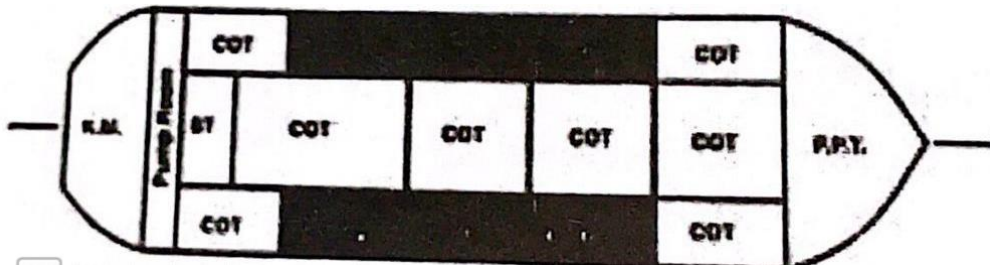


Figure 2. Concept of SBT: The tank for ballast water is placed on the left and right sides and serves as a protection of cargo tanks (Protective Location) against leakage.

Table 1. Oil disposal criteria.

Location at sea	Oil Disposal Criteria
50 nautical miles from the mainland	Should not be disposed except pure ballast water (clean ballast) or ballast water from SBT
Outside the "Special Area": more than 50 nautical miles from the coast	Should not be discharged unless: <ol style="list-style-type: none"> <li>a. Clean or segregated ballast (Reg.9.4) or</li> <li>b. When:                             <ol style="list-style-type: none"> <li>1. The ship is sailing</li> <li>2. The discharged oil is no more than 30 liters per nautical mile, and</li> <li>3. Total discharged oil is no more than 1/30,000th of the amount of cargo transported previously.</li> <li>4. The ship operates ODM and control systems and <i>slop tanks</i> (Reg.15)</li> </ol> </li> </ol>

Within the "special Area"	No oil discharge except pure ballast water or ballast water from SBT (Reg.10.2 and 3a)
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Table 2. Location at sea and ship type.

Location at Sea	Ship Type	criteria
More than 12 miles from the coast	Ships 400 GRTs or more prior to July 6, 1993 were equipped with <i>filtering equipment</i> (Reg. 16.1 or 2)	There is no disposal, except <ol style="list-style-type: none"> <li>1. the ship is sailing</li> <li>2. Oil content not more than 100 ppm</li> <li>3. Use OWS (Reg. 9.7)</li> </ol>
Outside the "Special Area"	Ships of all sizes and other vessels of 400 GRT or more	There is no disposal, except <ol style="list-style-type: none"> <li>1. the ship is sailing</li> <li>2. The oil content is not more than 15 ppm and</li> <li>3. Using ODM control system, OWS or <i>Filtering Equipment</i> (Reg. 9.1b)</li> </ol>
	Ships smaller than 400 GRT	Equipped as complete as possible (Reg 9.2)
Within the special area	Tankers of all sizes and other vessels of 400 GRT or more	There is no disposal, except <ol style="list-style-type: none"> <li>1. the ship is sailing</li> <li>2. The oil content is not more than 15 ppm and</li> <li>3. Using <i>Filtering Equipment</i> automatically stop at the limit of 15 ppm, and</li> <li>4. For tankers, Bilgewater does not come from the pump room or cargo mixture</li> </ol>
	Ships smaller than 400 GRT	Equipped as complete as possible (Reg 9.2)
Antarctic	Ships smaller than 400 GRT	No disposal except the oil content does not exceed 15 ppm (Reg 10.2b)
	All ships	No disposal (Reg 10.2a)

## 5.6. Reception Facilities

Ships of large size and engaged in international trade must be surveyed and certified. Ports are required to provide the facility to receive mixtures of oil and residues from ships. The government of a member state of the IMO or *Marine Administration* is obliged to carry it out on its own vessels (*Flag State Duties*), on foreign vessels entering its ports (*Port State Duties*), and on its coastal supervision (*Coastal State Duties*).

### ***Reception Facilities.***

Equipment used to overcome oil pollution:

1. **OWS:** This equipment is used to separate oil from water.
2. **OFE:** Oil filtering equipment. This equipment is used to regulate the discharge of oil at sea as much as 15 ppm.
3. **ODM:** This equipment is used to monitor oil disposal.
4. **Oil Born:** This equipment is used to localize oil spills
5. **Skimmer:** This equipment is used to block oil spills
6. **Oil Bag:** oil bags
7. **Sorbent:** This equipment is used to absorb oil spills
8. **Wilden pump:** This equipment is used to absorb oil spills and pump to slop tanks
9. **Spraying unit:** This equipment is used to spray oil spills at sea.

## 5.7. Oil Reception Equipment

1. Slop tank

A slop tank is a reception tank for dirty oil as the result of water processed by OWS. For the bilge in the engine room, the capacity of the slop tank is a minimum of 3% of the cargo tank capacity. If the ship has been equipped with SBT, then 2% is sufficient.

2. Sludge tank

A sludge tank is a tank to collect dirty oil from the bilge as the result of OWS (The minimum capacity is 2 % of the volume of the tanks).

### 3. Supervision system/monitoring

The Ship operates a Cargo Monitoring and Control System + Slop Tank

## 5.8. Reception Facilities Requirements

The contents of the SOPEP (*Shipboard Oil Pollution Emergency Plan*).

SOPEP is an emergency plan to overcome oil pollution from ships authorized by the administration of the country, in the form of a chart/book that provides guidance for the captain and the crew about the actions that must be taken to reduce/control oil spills due to an accident.

The first step that must be done in handling oil spills at sea is to localize oil spills using *oil booms*, which will then be transferred with *oil skimmers* to a "*reception*" or receiving facility either in the form of tanks or balloons.

This countermeasure will be very effective when done in waters that have low hydrodynamics (currents, tides, waves, etc.) and weather that is not extreme.

Some oil spill management techniques include in-situ burning, mechanical elimination, bioremediation, the use of sorbents, and the use of dispersant chemicals. Each of these techniques has a different oil removal rate and is only effective under certain conditions.

### 5.8.1. In-situ Burning

In-situ burning is the burning of oil on the surface of the water. This technique is effective to overcome the difficulties of pumping oil from the sea surface, and storage of associated oil and seawater, which is found in physical removal techniques. This technique requires the availability of booms (barriers to prevent the spread of oil) or fire-resistant barriers.

Some of the constraints of this technique are in the event of a large spill that cause difficulties to collect oil and maintain a sufficient thickness to burn as well as evaporation in flammable oil components.

On the other hand, combustion residues that sink on the seabed will have an adverse effect on ecology. Also, the possibility of uncontrolled spread of fire.



Figure 3. In-situ burning.

### **5.8.2. Elimination of Oil Mechanically**

The second technique is the elimination of oil mechanically. Oil is mechanically removed through two stages, namely localizing spills using booms and transferring oil into containers using mechanical equipment called skimmers.

This technique is difficult and expensive although it is considered an ideal solution, especially for reducing oil in sensitive areas, such as beaches and areas difficult to clean and in the early hours of spills. The presence of wind, currents and waves also become obstacles.

### **5.8.3. Bioremediation**

The third technique is bioremediation. Bioremediation is speeding up natural processes, for example by adding nutrients, so that there is a conversion of a number of components into less harmful components such as CO<sub>2</sub>, water, and biomass.

This technique has a small environmental impact and can reduce the impact of spills significantly. Unfortunately, this method can only be applied to certain types of beaches, such as sandy and gravel beaches, and is not effective for applying in the ocean.



Figure 4. Bioremediation.

#### 5.8.4. Sorbent

The fourth technique is using a sorbent that can remove the oil through the mechanism of adsorption (attachment of oil on the surface of the sorbent) and absorption (absorption of oil into the sorbent)

This sorbent serves to change the oil phase from liquid to solid so that it is easily collected and removed. The sorbent should have hydrophobic, oleophobic characteristics and be easily propagated on the surface of the oil, retrieved and reused.

There are 3 types of sorbents namely natural organics (cotton, hay, dry grass, sawdust), natural inorganic (clay, vermiculite, sand) and synthetic (polyurethane foam, polyethylene, polypropylene and nylon fibers).



Figure 5. Sorbent.

### 5.8.5. Chemical Dispersant

The fifth technique is to use chemical dispersant to break down the oil layer into small droplets so as to reduce the possibility of animals being trapped in the spills.

Chemical dispersants are chemicals with active substances called surfactants (derived from the word surfactants surface-active agents or surface-active substances).



Figure 6. Chemical Dispersant.

### 5.8.6. Oil Record Book

This book will only discuss Annex 1 because it is the main source of pollution nowadays. Annex 1 MARPOL 73/78 which discusses regulations to prevent pollution by oil spills from ships until July 6, 1993, has consisted of 26 regulations. The document that becomes an integral part of Annex 1 is Appendix I which discusses the list and the type of oil.

Appendix II consists of the format of the IOPP *Certificate*. Appendix III consists of the format of the Oil Record Book. Here is the content and form of the document discussed in MARPOL 73/78: b. The "*International Oil Pollution Prevention Certificate*" (IOPP Certificate) for all merchant vessels, in which supplements or attachments regarding the "*Record of Construction and Equipment for Ship other than oil Tankers and Oil Tankers*" is described separately in Appendix II MARPOL 73/78 c. "*Oil*



*Record Book*” is a log book placed on board, to record all activities dealing with the disposal of residual oil as well as oil and water mixtures in engine rooms for all ship types, and for loading and unloading activities of cargo and ballast water of tankers.

The *oil record book* is used daily to record activities such as the disposal of bilges out of ships, bunkers (fuel or oil supply), loading and unloading of oil cargo, transferring cargo, cleaning oil tanks, and so on. It is also used to record the date when performing the activity, the starting time and the time of completion of the activity, as well as the position in which the ship performs the activities.

The contents of the *OIL RECORD BOOK* are;

1. Filling or disposal of ballast tanks or cleaning of fuel oil tanks or cargo tanks.
2. Discharge of water from ballast tanks or cleaning of fuel tanks that have been filled with ballast or emptied.
3. Storage of oily residues (deposits).
4. Discharge bilges out of the ship from the engine room.
5. Burning used oil and garbage in INCINERATOR.
6. Bunker (supply of fuel or oil).
7. Transfer of fuel from the double bottom tank to another double bottom tank.
8. The number of contents of the BILGES TANK and SLUDGE TANK tanks when entering a port.<sup>[A18]</sup>



# CHAPTER VI.

## NOXIOUS LIQUID SUBSTANCES

### (ANNEX II)

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ANNEX II discusses the pollution by noxious liquid substances in bulk (April 6, 1987). Annex II applies to vessels that transport noxious liquids in the form of bulk/*chemical tankers*.

#### 6.1. Disposal of Noxious Chemicals According to Annex II Marpol 73/78

1. Category A: any materials mixed with tank cleaning water /ballast water should not be discharged at sea in all locations.
2. Category B: ballast water, tank cleaning water/mixtures containing such substances are prohibited, unless:
  - a. The ship is continuing its voyage at a speed of min 7 knots.
  - b. Procedures and arrangements for disposal are approved by government agencies.
  - c. The amount of maximal disposal cargo from each tank and the pipeline system associated with it does not exceed 1 M3 or 1/3,000 Tank capacity in M3.
  - d. Disposal is carried out below the water line.
  - e. The discharge is carried out 12 nautical miles from the nearest land with a minimum water depth of 25 meters.
3. Category C: ballast water, the residue of the tank cleaning/mixture containing such substances is prohibited, unless:

- a. The disposal must be approved by government agencies.
  - b. The ship is sailing at a speed of 7 knots for self-propelled ships, 4 knots for an ships that are not self-propelled.
  - c. The maximum amount of disposal cargo does not exceed 1: 30000 *tank capacity*.
  - d. Disposal is carried out below the water line
  - e. The disposal distance is > 12 miles from the mainland which has a water depth of not less than 25 meters.
4. Category D: ballast water, the residue of the tank cleaning/mixture containing such substances is prohibited, unless:
    - a. The ship is continuing its sailing at a minimum speed of 7 knots
    - b. Such a mixture should not be greater than one part of the material in 10 parts of water (1ptt).

Noxious liquids are divided into 4 categories ABCD, as follows:

1. Category A = Very dangerous. This is a toxic liquid material that when discharged into the sea can pose a major hazard to the marine ecosystem and human health.
2. Category B = Dangerous. This is a toxic liquid material that when discharged into the sea can pose a danger to the marine ecosystem and human health
3. Category C = Minor hazards. This is a toxic liquid material that when discharged into the sea can pose a minor hazard to the marine ecosystem and human health.
4. Category D = Hazard. This is a toxic liquid material that when discharged into the sea can pose a danger to the marine ecosystem and human health.

Examples of liquid materials that belong to categories A, B, C, D.

1. Category A: Acetan, Cyanohydrin, carbon disulfide, Camphor oil
2. Category B: Acrylonitrile, Alkyl Alcohol, Benzol Chloride, Chloroform

3. Category C: Benzenes, Hydroxide, Cyclohexane
4. Category D: Butylene, Cyclohexanol.

## 6.2. Noxious Liquid Substance in Bulk Under Supervision (Annex II)

Regulations for the monitoring of pollution from Noxious Liquid Substances

1. After being surveyed, vessels carrying NLS will be given a certificate of *International Pollution Prevention Certificate for The Carriage of Noxious Liquid Substance in Bulk*.
2. The certificate is valid for 5 years with requirements that must be endorsed annually
3. Surveys conducted in connection with the certificate are:
  - a. Initial survey before the ship is operated for the first time.
  - b. Annual survey within 3 months before or after anniversary date from the certificate.
  - c. Intermediate survey in 3 months before or after the 2nd or 3rd Anniversary date.
  - d. Renewal survey every 5 years or according to the certificate validity period.
  - e. Additional surveys if needed.

Ships that have been surveyed and given the certificate of *International Bulk Carrier Chemical Code* (IBC Code) or *Bulk Chemical Code* (BCH Code) are not required to be surveyed again to obtain NLS Certificate. In addition, this ship must also be equipped with an *IOPP Certificate*.

**Supervision.**

1. The government of each country must appoint a surveyor to supervise the implementation of this rule according to the guideline of the IMO.
2. The captains of ships carrying noxious liquids must ensure that all provisions have been met and the Cargo Record Book is filled in accordance with the provisions.

#### Supervision of category A tankers:

1. Upon completion of the unloading, before the ship departs, the tanks must be washed (preliminary wash/pre-wash) and the water is discharged into the reception facility until the concentration of noxious liquid substances in the water is less than 0.1% in weight. Then, it will be pumped until empty (for the type of phosphor, concentration in the water is less than 0.01% in weight).
2. When water is put into the tanks, the wash water can be discharged into the sea according to the requirements:
  - a. The ship is outside the special area.
  - b. The ship is sailing at a speed of 7 knots for the self-propelled ships and 4 knots for the ships that are not self-propelled.
  - c. Scuppers are below the water line.
  - d. Disposal at a distance of not less than 12 miles from the mainland with a depth of not less than 25 m.

#### Supervision of category B Tankers:

After completion of unloading, the tanks are washed (pre-wash) until the remaining cargo in the tanks is not more than 1 m<sup>3</sup> or 1/3000 tank capacity and discharged to the *reception facility*. If water is put into the tanks, the wash water can be discharged into the sea according to the requirements:

1. The ship is outside a special area.
2. The ship is sailing at a speed of 7 knots for self-propelled ships and 4 knots for ships that are not self-propelled.
3. The concentration of toxic substances above the propeller does not exceed 1 ppm.

4. The discharge is carried out no less than 12 miles from the mainland at a depth of more than 25 m.

**Supervision of category C Tankers:**

1. After completion of unloading, the tanks are washed (pre-wash) until the remaining cargo in the tanks is not more than 1 m<sup>3</sup> or 1/3000 tank capacity.
2. If water is put into the tanks, the wash water can be discharged into the sea according to the following requirements:
  - a. The ship is outside the special area.
  - b. The ship is sailing at a speed of 7 knots for the self-propelled ships and 4 knots for the non-self-propelled ships.
  - c. The discharge is below the water line.
  - d. The ship is located more than 12 miles from land at a depth of 25 m or more.

Upon request from the captain, the pre-wash can be eliminated with the following conditions:

1. The tanks do not need to be washed because they will be used to load the same type of cargo or that can be combined.
2. The tanks will not be washed at sea, instead, they will be washed in another port as long as there is a written guarantee from the port.
3. The loading system is eliminated with a government-approved ventilation system based on IMO standards.

Category D does not need any pre-wash and can be discharged to the sea under the following conditions:

1. The ship is sailing outside the special areas.
2. The speed is not less than 7 knots for the self-propelled ships and 4 knots for the non-self-propelled ships.
3. The concentration is not more than 1/10.
4. The discharge is conducted at a distance of 12 miles with a depth of not less than 25 meters.

The impacts of toxic goods pollution in particular:

1. Damage to the biodiversity of the sea and life at sea.
2. Danger to human health.
3. Disruption to activities at sea.
4. Decrease in seawater quality.
5. Reduce comfort.

The content of the P & I MANUAL is:

1. Overview of Annex II MARPOL 73/78
2. Description of the equipment and arrangement of the ship
3. Loading unloading procedures and installation of cargo tanks
4. Procedures related to the cleaning of the cargo tanks, residual disposal, filling and disposal of ballast water.

The supervision of pollution by noxious substances in bulk is regulated in MARPOL 73/78 Annex II regarding Regulation of Pollution Control by Noxious Liquid Substances transported on ships in bulk.

### **6.3. Procedures in Conducting Survey and Certification and Their Validity Period**

1. After being surveyed, vessels carrying NLS are given certificate of *International Pollution Prevention Certificate for The Carriage of Noxious Liquid Substance in Bulk*.
2. The certificate is valid for 5 years with the requirement that it must be endorsed annually.
3. Surveys conducted in connection with the certificate are:
  - a. Initial survey before the ship is operated for the first time.
  - b. Annual survey within 3 months before or after anniversary date from the certificate.
  - c. Intermediate survey in 3 months before or after the 2nd or 3rd Anniversary date.



- d. Renewal survey every 5 years or according to the certificate validity period.
  - e. Additional surveys if needed.
4. For ships that have been surveyed and given an International Bulk Carrier Chemical Code (IBC Code) or Bulk Chemical Code (BCH Code) certificate, there is no need to be surveyed again to obtain NLS Certificate. In addition, this ship must also be equipped with an IOPP Certificate.



# CHAPTER VII. EQUIPMENT FOR PREVENTING POLLUTION BY HARMFUL SUBSTANCES CARRIED BY SEA IN PACKAGED FORM (ANNEX III)

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## 7.1. Supervision Regulation of Pollution by Harmful Substances in Packaged Form

MARPOL 73/78 ANNEX III discusses the prevention of pollution by harmful substances in packaged form transported by ships. Things that need to be considered are as follows:

- 1) *Packing* should minimize hazards to the environment according to the specificity of its contents.
- 2) *Marking and Labelling*. Give a mark that comes with the technical name and UN number. The mark should not disappear even if immersed in the sea for 3 months.
- 3) *Documentation*. All documents must use the technical name and included words.

## 7.2. Requirements to Reduce Pollution Due to Accidents Caused by Harmful Substances

- a. *Packing*:  
Packaging should be strong enough to minimize the dangers that may be caused to the environment.

- b. *Marking and labeling:*
  - a. Packaging containing harmful substances must be equipped with detailed information and attached with a label describing them as a marine pollutant.
  - b. Materials for marking and labeling must last for 3 months of sailing.
- c. *Documentation:*

All goods must be equipped with certificates as inspection subjects.
- d. *Stowage:*

All dangerous goods must be stored safely so as not to cause pollution to the marine environment by not endangering the ship and its passengers.
- e. *Quantity limitations:*

Limiting the amount of substance that could endanger the marine environment.

### **7.3. Regulations to Prevent Pollution by Harmful Substances Carried by Sea in the Packaged Form**

1. Rule 1: Application
2. Rule 2: Packing
3. Rule 3: Marking and Labelling
4. Rule 4: Documentation
5. Rule 5: Stowage
6. Rule 6: Quantity Limitations
7. Rule 7: Exceptions
8. Rule 8: *Port State Control on Operational Requirements*

### **7.4. List of Harmful substances and how to fill a Cargo Record Book**

Cargo Record Book contains:

1. Loading and unloading cargo
2. Displacing between cargo tanks

3. Cleaning the cargo tanks
4. Filling and disposing of ballast water into/from cargo tanks
5. Removing residues to the reception facility at the port
6. Disposal into the sea or evaporation by ventilation.

Contents of the cargo record book regarding destructive liquid materials:

1. Class
2. The type of cargo
3. Loading place/location
4. Amount

The cargo record book must be kept in a place ready to be checked at any reasonable time. The book is stored for a period of up to 3 years from the last filling.

The information recorded in the cargo record book includes:

1. Loading and unloading oil cargo
2. Transfer of oil cargo during the voyage
3. Opening/closing valves or similar tools that connect between the tanks and the cargo tanks before and after loading or unloading.
4. Opening/closing of connecting facilities between cargo pipelines and ballast pipelines
5. Opening/closing of vessel hull valves before, during, and after loading/unloading operations
6. Ballast filling into cargo tanks
7. Cleaning cargo tanks
8. Ballast disposal except for clean/separated ballast
9. Disposal of water from sewage tanks
10. Cleaning of residual materials

### **7.5. Regulations on the Prevention of Pollution by Harmful Substances Transported through Sea in Containers**

1. *Packing:* Packaging should be adequate to minimize the dangers that may impact the environment.

2. **Marking and labeling:**
  - a. Packaging containing hazardous substances must be supplemented with detailed information and given a label of marine pollutant.
  - b. Materials for marking and labeling must last for 3 months of sailing
3. **Documentation:** All goods must be equipped with certificates as inspection subjects
4. **Stowage:** All dangerous goods must be stored safely so as not to cause pollution to the marine environment by not endangering the ship and its passengers.
5. **Quantity limitations:** Limiting the amount of substance that could endanger the marine environment.

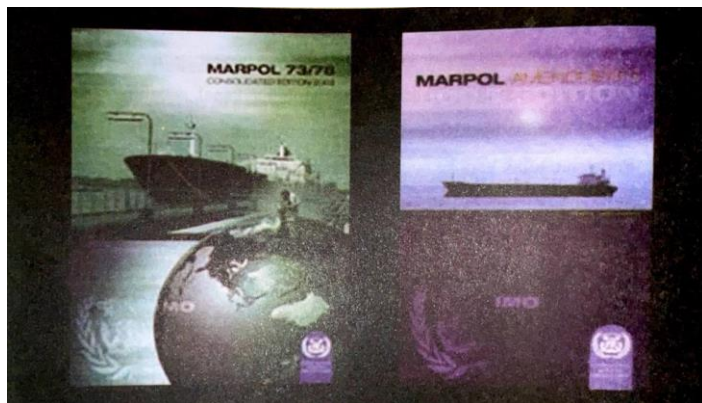


Figure 7. Marpol regulation.

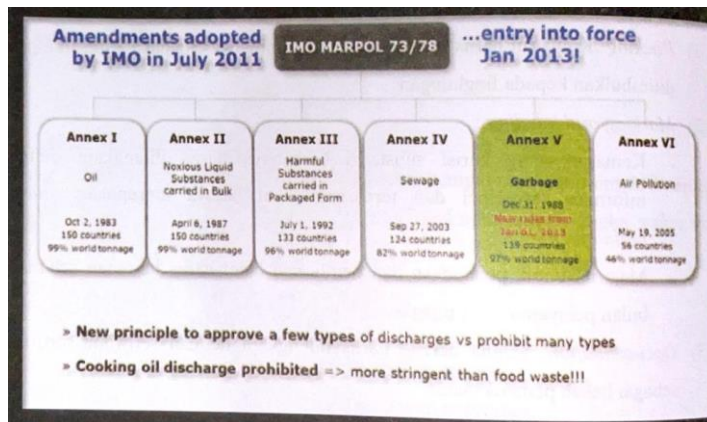


Figure 8. Amandements adopted by IMO.

# CHAPTER VIII.

## SEWAGE POLLUTION (ANNEX IV)

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Regulation on the prevention of pollution by sewage from ships and their application are discussed in MARPOL Annex IV regulation of pollution by Sewage from Ships.

### 8.1. Sewage

Sewage is any kind of waste that comes from toilet wastewater, sewer, defecation, medical residue, handwashing places (sink) or laundry tubs, wastewater from animal feces, and wastewater mixed with the above components. When the ship is sailing, the sewage is collected in a reception tank on the ship. When the ship is at the port, the sewage in the tank is discharged into the "*reception facility*" at the port.

1. Requirements for disposing sewage into the sea according to the Annex IV MARPOL 73/38:
  - a. The ship should dispose of bacteria-free sewages using a "*system sewage treatment plan*" which is approved by the government administration, at a distance of  $> 4$  miles from the nearest land.
  - b. Sewage that has not free from bacteria or pests should be disposed of at a distance of more than 12 miles from the nearest land.
  - c. Sewage that is temporally stored in a tank, should not be disposed of simultaneously, but with the movement of ships traveling at a speed of no more than 4 knots.
  - d. While in port, the sewage is discharged into the *reception facility*.

2. The size of the ship imposed in Annex IV is:
  - a. ü new vessel > 400 GT
  - b. ü new vessel < 400 GT certified to carry > 15 people
  - c. ü new vessel > 400 GT: 5 years after the annex's enactment
  - d. ü new vessel < 400 GT certified to carry > 15 persons, 5 years after the date of entry into force of this Annex involved in international shipping.

### **8.2. Certificates that Must be Owned by Every Ship that Carries Sewage is: “*International Sewage Pollution Prevention Certificate*” (ISPPC).**

*A Reception Facility* is a reservoir facility on the land that is not only used to collect sewage but also used to collect the remaining oil, toxic liquid substances, and garbage originating from ships. Countries that participate in the MARPOL Convention 73/78 are required to prepare and maintain sufficient reception facilities on the land.



# CHAPTER IX.

## GARBAGE POLLUTION (ANNEX V)

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### 9.1. Garbage

Garbage is all kinds of food waste, domestic and operational waste, and all kinds of unused materials from ships or domestic waste materials. Examples of waste on the ship include paper, plastic, metal, etc.

Unlike sewage, garbage handling has a special rule, namely the *Garbage Management Plan* and *Garbage Record Book* which serves as a record in every garbage disposal/burning. This book is filled in English by the officer on duty and each page is signed by the captain.

The contents of the *Garbage Management Plan* are:

1. Any disposal or burning should be recorded in the Garbage Record Book.
2. Position of the ship.
3. Execution time.
4. Garbage volume.
5. Types of garbage.

In case of disposal by accident, the location of the disposal and the reason for disposal should be recorded.

All ships that are > 400 GT and carry 15 people must have a *Garbage Management Plan* and *Garbage Record Book*.

## 9.2. Garbage Disposal Requirements According to Annex V MARPOL 73/78:

1. At a distance of 3 miles from the nearest land, food waste can be disposed of when it has been destroyed and can pass through a 26mm filter
2. At a distance of 12 miles from the nearest land, food waste can be disposed of at a distance of 500m from the platform, on the condition that it has been destroyed.
3. At a distance of more than 12 miles from the nearest land, the following garbage can be disposed of: paper, rags, metal, bottles, and food waste.
4. At a distance of more than 25 miles from the nearest land, the following garbage can be disposed of: dunnage, rope materials, and floating packages.

All kinds of plastic are not allowed to be disposed into the sea, including:

1. Plastic ropes.
2. Plastic nets.
3. Plastic bags.
4. Nylon as a residue of plastic combustion from the incinerator.

## 9.3. The Certificate that Must be Owned If the Ship Transports Garbage is: "International Air Pollution Prevention Certificate" (IAPPC)

Besides being used to burn paper, incinerator is also used to burn residual oil derived from the removal of oil and water in OWS (*Oily Water Separator*), used rags, sawdust, and used lubricating oil.



Figure 9. Incinerator.



# CHAPTER X.

## AIR POLLUTION (ANNEX VI)

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### 10.1. Definition of Air Pollution

As quoted from Wikipedia, the definition of air pollution is the presence of physical, biological, or chemical substances in the earth's air layer in quantities that can endanger the health of all biotic components that make up the ecosystem, have an impact on the beauty and comfort, and damage property.

### **MARPOL 73/78 ANNEX VI Prevention Regulation of Air Pollution from Ships.**

On 26 September 1997, participants of the MARPOL Convention 1973/Protocol 1978, adopted Annex VI: regulations for the Prevention of Air Pollution from Ships (1997 Protocol)

1. Hazards that can threaten the vessels:
  - a. Internal and.
  - b. External.
2. Hazards that can threaten the preservation of the marine environment:
  - a. Oil.
  - b. Noxious liquid substances (NLS).
  - c. Harmful goods in packaged form.
  - d. Sewage.
  - e. Garbage.

3. Hazards that can threaten the atmosphere:  
\*disposal to the atmosphere:
  - a. Excessive SO<sub>2</sub> from fuel combustion and NO<sub>2</sub> from diesel motors.
  - b. Volatile organic components of cargo of tanker.
  - c. Gases that damage the ozone layer such as CFCs.

Annex VI Contains regulations concerning restrictions on Sulphur oxide (Nok) levels of exhaust gases and prohibitions on the use of gases that damage ozone.

## **10.2. How to Prevent Pollution on Board**

1. Implementing SOPEP, Team bunker, SBT, ORB, ODM – CS, slop tank, sludge tank.
2. Implementing sewage plan.
3. Implementing garbage plan.
4. Improving the quality of human resources
  - a. Oil water separating equipment (OWS).
  - b. Oil discharging monitoring system (ODM).
  - c. Crude oil washing (COW).
  - d. Dedicated clean ballast tank (CBT).  
As the cargo tanks are cleaned to be filled with ballast water.
  - e. Segregated ballast tank (SBT).  
As a protector or protection location and completely separate the ballast water system from the loading and unloading oil system.

# CHAPTER XI.

# MARINE AND COASTAL POLLUTION

# CASES

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## 11.1. Oil Pollution

Examples of ship accidents that have occurred:

### 1. Oil Spill.

Arabian Gulf, in late January of the 1991 Gulf War, the Iraqi Army destroyed tankers, oil refineries, and oil wells in Kuwait causing the release of about 900 million barrels of oil. This is the largest oil spill tragedy in history.

### 2. Showa Maru in the Strait of Malacca in 1975.

The events that took place in 1975 make it an interesting case to be used as one example because this case occurred in the midst of a lack of international and national legalization. The Japanese ship spilled 1 million tons of crude oil. In January 1975 the tanker Showa Maru, carrying crude oil from the Persian Gulf to Japan ran aground and spilled oil in the Strait of Malacca, spilling as much as 7,300 tons of crude oil. Based on information from the Indonesian Maritime Court, the grounding of the Showa Maru began with the negligence of the captain, which caused the tanker hit the reef and resulted in damage to the bottom of the ship 160 meters long.

### 3. Amoco Cadiz off the Coast of France 1978.

Amoco Cadiz is a VLCC (Very Large Crude Carrier) that ran aground off the coast of Brittany, France on March 16, 1978. The entire cargo

of 68.7 million gallons of oil spilled into the ocean, polluting about 200 miles of Brittany's coastline.

An oil spill, intentional or not, is a very dangerous source of pollution. Oil spills into the sea can come from tankers that have collided or run aground, or from deliberate processes such as ballast tank washing, inter-ship oil transfer, or crew negligence.

## **11.2. Pollution by Heavy Metals**

Examples of pollution due to heavy metals in Indonesia:

The Buyat Bay, located in Minahasa Regency, North Sulawesi, is the location of the disposal of tailing waste (mud leftover from the crushed mining stones) belonging to PT. Newmont Minahasa Raya (NMR). Since 1996, the Denver-based company dumped as much as 2,000 tons of tailings waste into the bottom of The Buyat bay every day. A number of fish were found to have tumor-like lumps and contained a thick black liquid and golden yellow mucus. A similar phenomenon is found in a number of residents of Buyat. They have bumps on the neck, breasts, calves, wrists, buttocks and head.

## **11.3. Pollution By Garbage on Beaches Around Jakarta**

Garbage can distract the movement of marine animals (such as fish, turtles, and seals) if they get entangled. Garbage in the sea (such as plastic bags, nets, and fishing lines), either floating or sinking, becomes a barrier to the movement of marine animals. Many fish cannot swim easily because of plastics, sometimes they even get entangled in fishing nets.

Many marine animals die because they mistakenly eat plastic waste as food. Garbage also contaminates the food of marine animals. Many animals such as fish, turtles, and even birds eat fish that have been contaminated. Many of them die because plastic waste is dangerous and cannot decompose. It will become more dangerous if fish that have been contaminated by toxins are consumed by humans. Many beaches have been polluted by garbage, one of which is a beach in the city of Jakarta.



#### **11.4. Pollution Due to Eutrophication Process**

The report mentions that these events are concentrated in coastal areas in Western Europe, the East and south coasts of the United States, and East Asia, especially in Japan. One example is the significant increase in red algae or red tides that kill fish and marine mammals and cause respiratory problems in humans and some domestic animals. It generally occurs when the organism approaches the shore.



# CHAPTER XII.

## OVERCOME THE CASE OF MARINE AND COASTAL POLLUTION

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### 12.1. Showa Maru Oil Spill Case

Following up on the case of the oil spill, immediate actions were taken by the Indonesian government by forming 3 Task Forces under the coordination of three ministers, namely the Minister of Transportation who handled operational technical aspects, the Minister of Research and Technology who dealt with research and the Minister of Justice who prepared legal tools and compensation. In terms of law, the Showa Maru problem at that time actually put Indonesia in a very weak and difficult position in legal settlements and claims for compensation. Besides the unavailability of a National Law on Marine Pollution, the existing international conventions such as the Brussels Convention of 1969 have not been ratified.

To address this, the Indonesian delegation consulted Malaysia, Singapore, Thailand, and the Philippines. However, the delegation's efforts were unsuccessful because the law against marine pollution in the countries was also still in its early stages, except for Singapore, whose legal system had referred to the London Convention of 1954.

Indonesia received compensation from the owner of Showa Maru, a Japanese tanker that ran aground due to a leak in the Strait of Malacca, in January 1975. The payment (US\$1.2 million) is only the first phase of the payment and will be used for the cost of cleaning up Indonesia's polluted waters as well as the payment of compensation for fishermen who lost their job due to the incident. However, 3 years after the incident

the issue of compensation still left problems for residents of Riau Islands Regency, namely the issue of compensation for residents who suffer direct or indirect losses due to polluted marine areas.

## 12.2. Buyat Bay Case

Some of the actions to deal with pollution cases in Buyat are:

1. The Ministry of Health determines the type of disease suffered by residents and conducts treatment and if necessary, prevention.
2. Form a team to conduct an integrated investigation consisting of the Directing Team and the Technical Team. This team consists of relevant government agencies, local governments, NGOs, universities, and experts. The central-level integrated team will cooperate with the Independent Team at the Regional level.
3. Provide information to the public continuously.
4. Law enforcement against violating parties.

## 12.3. Pollution Due to Garbage Case

1. No littering.

The problem of garbage is the basic issue of environmental pollution. Everyone is certainly very capable of disposing of garbage in the place that has been provided. However, our culture seems to let garbage disposal in any place which can cause damage to the environment. In fact, disposing garbage in its place is a real step for those who concern about environmental health. Garbage is can be categorized into 2 types: dry or wet garbage. In addition, there are types of organic and non-organic garbage. The existence of this classification is aimed as an effort to prevent pollution.

2. Reduce Plastic Use.

Avoiding plastic is certainly a very difficult thing. Therefore, we are only required to reduce the use of plastic. If possible, we should avoid plastic use. Instead of using plastic bags, we can bring a special tote bag when shopping. Even if you really have to use plastic, choose environmentally friendly plastic. Nowadays, bags made of

recycled and environmentally friendly materials become popular. The purpose of these materials is also to minimize pollution to the environment.

#### **12.4. Pollution Due to Eutrophication Process**

Phosphate removal in a fluidized bed reactor (FBR) using quartz sand can produce struvite crystals ( $MgNH_4PO_4$ ). This removal by crystallization is carried out by continuous aeration and can achieve an efficiency of 80% within 120-150, emitters (Battistoni, et al., 1997).

According to Forsberg 1998, strict policies are very needed to control population growth. Because in line with the population of humans that continues to increase, the release of phosphate into the water environment from the sources mentioned above will also increase.



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# AUTHOR'S PROFILE

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## Winarno



Dr. Winarno, S.S.T., M.H. was born in Jogjakarta in February 8, 1976. He graduated from Balai Pendidikan dan Latihan Pelayaran (BPLP) now Politeknik Ilmu Pelayaran (PIP) Semarang with Diploma IV degree in 2001. He then completed his Master degree in Law/MIH at Sultan Agung Islamic University (UNISSULA) Semarang in 2006, and graduated from the Doctoral Program in Law/PDIH (S3) UNISSULA Semarang in April 2016. Besides being a Lecturer at Politeknik Ilmu Pelayaran (PIP) Semarang, he also teaches at Akademi Maritim Yogyakarta (AMY) and Postgraduate (S2) Master in Coastal Resources (MSDP) at the Faculty of Fisheries and Marine Sciences (FPIK) Diponegoro University (UNDIP) Semarang.

Some of the training and seminars that have been attended include the Port and Shipping Summer Course at Hochschule Bremen Germany, International Journal training at the International Islamic University Malaysia (IIUM), Comparative Studies at the Singapore Maritime Academy, Integrated Simulation Center of Singapore, Pekerti and AA at Semarang State University. (UNNES), Training for Caretakers of Cadets for Transportation BPSDM Cadets at the Magelang Military Academy, QSS Auditor Training, TOT IMO Model Course 609, TOT IMO 312, Certification of Experts on Government Procurement of Goods and Services at LAN RI, Level IV Leadership Training of the Ministry of Transportation at the Development Center Bogor Transportation Apparatus, Competency Assessors of the National Professional Certification Agency (BNSP), LSP Quality Management Implementation

Training at BNSP, Academic World International Conference in Singapore, ICMET International Conference at PIP Semarang, etc.

He has some books written with ISBNs namely Immigration for Commercial Shipping and Customs Basics for Commercial Shipping.

## Andi Prasetiawan



Andi Prasetiawan, S.Si.T, was born in Tegal on January 3, 1981. Currently, he works as a Lecturer in the Port and Shipping Management study program. He went to elementary school to high school in Tegal. He got his Diploma-I degree from Politeknik Negeri Semarang in 2000 and

obtained his Diploma-IV degree from Politeknik Ilmu Pelayaran Semarang majoring in Port and Shipping Management in 2004. He successfully completed his Master degree in 2010 majoring in Marketing Management at Institut Bisnis Informatika Indonesia, Jakarta. Currently, besides teaching as a lecturer, he also organizes the teaching and learning activities in the Port and Shipping Management study program at Politeknik Ilmu Pelayaran Semarang.

## Nur Rohmah



Nur Rohmah, SE., MM, is one of the lecturers in the Port and Shipping Management study program. She was born in Boyolali on March 18, 1975. She completed her Elementary School to Senior High School in Boyolali. In 1996, she graduated from Balai Pendidikan dan Latihan Pelayaran (BPLP) Semarang and got her Diploma-III Degree. In 2009 she successfully completed her undergraduate study at the Universitas Semarang majoring in Management Economics. Then in 2011 she successfully completed her master's degree at the same university, majoring in Management. Currently, the author is a Lecturer as well as Secretary of the Port and Shipping Management Study Program at Politeknik Ilmu Pelayaran Semarang.

# TRANSLATOR'S PROFILE [a9]

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## Azza Azkiya



Azza Azkiya, S.Pd. was born in Kebumen, 26 July 1995. She completed her elementary, middle, and high school in Kebumen. In 2017, she graduated from Universitas Negeri Semarang with a bachelor degree in English Education.

Currently, she is pursuing a Master Degree in English Education at Universitas Negeri Semarang. Besides actively participating in translation activities, she also has been teaching English to high school students and maritime cadets.

## Latifa Ika Sari



Dr. Latifa Ika Sari, M.Pd. is an English lecturer at Politeknik Ilmu Pelayaran (PIP) Semarang. Born in Semarang, on July 31, 1985, she has a great passion for the field of English Education and Psychology. In 2006, Latifa completed her Diploma III majoring in English for Office Management at Universitas Dian Nuswantoro Semarang. In 2008, She completed her Bachelor's Degree in Psychology at Universitas Diponegoro (UNDIP) Semarang. In 2014, he obtained a Bachelor's degree in English Education from Universitas Terbuka, Jakarta. Her Master degree in English Education was achieved in 2017 from Universitas Negeri Semarang (UNNES). Her best achievement was in 2021 in which she completed her doctoral degree in English education from the same university.

Latifa joined the Ministry of Transportation in 2008. Starting her career as a counselor for cadets at Balai Pendidikan dan Pelatihan Ilmu Pelayaran Tangerang (now Politeknik Pelayaran Banten), she was then assigned to teach Maritime English in 2009. In 2015, Latifa moved to Politeknik Ilmu Pelayaran (PIP) Semarang and was appointed to become a lecturer in 2019.

Latifa actively participates in various scientific meetings (seminars, conferences) related to English language teaching and learning. She has written several research articles published in various proceedings and journals. Her research interests include English for Specific Purposes (ESP), Maritime English, evaluation, and social semiotics.



# Introduction to The Prevention of Marine Pollution for Sea Transport

A ship is a means of sea transportation that is very economical and can transport large quantities of cargo. However, there are risks of pollution as the result of garbage or waste dumped at sea from ship operations that can threaten the sea ecosystem,

Sea pollution has a great impact on humans. Therefore, the prevention of pollution at sea must be regulated to ensure the continuity of the biological environment at sea.

This book is compiled as a form of the authors' concern towards the prevention of marine pollution in order to provide knowledge to the readers about the importance of maintaining marine sustainability.

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