Contingency planning for dangerous goods in port area: Tanjung Perak Surabaya

Roy Kasiono

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CONTINGENCY PLANNING FOR DANGEROUS GOODS IN PORT AREA (TANJUNG PERAK SURABAYA)

By

ROY KASIONO

The Republic of Indonesia

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

MASTER OF SCIENCE

in

GENERAL MARITIME ADMINISTRATION AND ENVIRONMENT PROTECTION

1996

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DECLARATION

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

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

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ABSTRACT

Title of Dissertation: Contingency Planning for Dangerous Goods in Port of Surabaya

Degree: Msc

The dissertation is a study of the present situation in the Port of Surabaya in relation to its probable capability in establishing a reliable and feasible contingency planning for dangerous goods accidents in the port and its surrounding area for its sustainable development.

An overview of international, national, and local regulations, dealing with dangerous goods is given in brief. This establishes the range and extent of regulations that a contingency plan for dangerous goods for a port area should be determined by.

An analysis of the impact of dangerous goods discharges are given in order to show the importance to have a sufficient system of prevention and response to dangerous goods accident as part of total port environmental management.

Accidents, their preventions, responses and clean up of dangerous goods discharges are described in order to give a general understanding of basic technical information on the equipment and resources which should exist, how they should be properly managed, and updated for a contingency planning for dangerous goods.

The existing situation and condition in ports of Surabaya are reviewed to know the actual management practices and facilities with regard to the extent that they may inhibit or promote the establishment of a contingency planning for dangerous goods. Particular attention is given to the management of activities for dealing with dangerous goods in the port.
Based on the previous discussion, a proposed contingency plan for dangerous goods in port of Surabaya is put forward.

Conclusions and recommendations for action planning toward the achievement of the proposed contingency plan is given.
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<td>LEL</td>
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CHAPTER ONE
INTRODUCTION

1.1 Background of Issues

The danger of hazardous materials has long been recognized since 2000-1500 B.C. The ancient codes of Hammurabi and the laws of Moses addressed their capability of causing disease and injury to human. This, together with their destructive effects on environment attributed to the materials have now also greatly attracted the international attention.

More and more kinds of such materials are being invented and increasingly used throughout the world. They are mostly transported by sea, which means that the chain of the transport will include ports. Realising the unexpected jeopardizing behaviours of the substances and learning from the accidents which keep occurring from the transports by sea a of such materials within and near ports areas, people have been attempting to seek the most secure ways to prevent, prepare, and response to such incidents by analysing the risk to the human health, property, and the environment through the overall sea transportation process, including the process of their transporting, handling, and storage in ports.

Preventing is undeniably better than responding the occurences of accidents. Yet Preventive action needs to be efficient and effective in order to be of maximum value without causing unnecessary loss of time and undue delay to ship calling a port. However accidents happen despite human effort to prevent them. When it
occurs, an effective and efficient prompt response have to be acted in order to prevent things getting worse so minimizing the impact of the accident, which is not an easy thing to do, for a numbers of reasons.

The Port of Tanjung Perak Surabaya or Port of Surabaya, to use another name referring to the same port, is one of the four major ports in Indonesia. This port is also open for international trade besides the other 128 Indonesian international ports. It serves the main areas of industrial and commercial development and thus carries goods and products outbound and inbound. It is subject to shipping and trans-shipping forms of marine pollution and incidents caused by, notably oils and greases, chemicals, solid wastes, and other materials that may escape or be discarded during the entire process of cargo handling, transporting and storage operations.

The port needs to develop and implement an appropriate system for marine pollution and maritime safety, accident prevention, control and response consistent with existing rules and regulation and international conventions already ratified by Indonesia. These include routine pollution and safety control and preparation for implementing effective counter measures in the event of accidental discharges or other emergency cases involving safety and pollution.

In this dissertation the writer analyses the emergency response system focusing on the contingency planning for dangerous goods incidents as an integral part of whole environmental and safety management system in the Port of Tanjung Perak Surabaya.

Records show that accidents caused by dangerous goods keep happening in the Port area both on the wharfs, warehouses, trucks and on board ships in the Port’s approaching channels. This affects the health of port workers and results to some extent in the loss or damage of cargoes as well as port infrastructures.
It is therefore wise for the port to have reasonable integrated emergency response system and an effective and efficient contingency plan for dangerous cargo accidents using the existing capacities and capabilities of the resources available.

1.2 Objectives

The general objective of this dissertation is to identify initiatives, proactive measures necessary and feasible for the port of Surabaya to take in establishing careful contingency planning for dangerous goods accident. This is expected to be important step in establishing, maintaining, and fostering a high awareness for the policy maker to involve the safety and pollution management in their decision, for sustainable development.

The specific objectives are:

• To analyse the impact of dangerous goods discharges leading to the need for a reliable contingency plan integrated in the whole management of dangerous goods in port area. This will be discussed in Chapter Two.

• To carry out an overview of the existing regulatory framework for contingency planning for dangerous goods accidents internationally, nationally, and locally as to see their adequacy as a legal basis to the establishment of contingency plan in port area. This will be presented in Chapter Three.

• To examine the dangerous goods accidents in order to give total clear picture of dangerous goods accidents in order to give total clear picture of dangerous goods discharges, measures of prevention, and response to such discharges. This will be dealt with in chapter four.
• To give brief description of the dangerous goods discharges in the port area of Surabaya with the purpose to see the existing condition and situation of the port to deal with dangerous goods in case of accidents happen. This will be talked about in Chapter Five.

• To propose some initiatives taken for contingency planning for dangerous goods in port of Surabaya based on the analysis presented in the previous chapters. This will be the concern of Chapter Six.

• To come to conclusions and make recommendation on existing situations and try to identify feasible action plans that can possibly be taken as a proactive measure to begin a contingency plan for dangerous goods in port area of Surabaya. This is discussed in Chapter Seven.
2.1 Effects of Discharged Dangerous Goods

International Maritime Dangerous Goods (IMDG) Codes put dangerous goods into 9 (nine) groups according to the type of hazard they represent. The classes are further subdivided into divisions and each division is made according to the hazard characteristics. A numerical coding is used with the classes numbered 1 to 9 followed by a decimal point and then a division numeral. The nine classes, their divisions where applicable and a brief description of their characteristics are:

Class 1. Explosives
1.1 A substance or article with a mass explosion hazard.
1.2 A substance or article with a fragment projection hazard, but not a mass explosion hazard.
1.3 A substance or article which has a fire hazard along with either a minor blast hazard or both, but not a mass explosion hazard.
1.4 A substance or article which present no significant hazard-explosion effects are largely confined to the package and no projections or fragments of appreciable size or range are to be expected.
1.5 A very insensitive substance which nevertheless has a mass explosion hazard like those substances in 1.1

Class 2. Gases
2.1 A flammable gas
2.2 A non-flammable, non-toxic, non-corrosive gas
2.3 A poisonous gas
2.4 A corrosive gas

Class 3. Flammable liquids

3.1 A liquid with a closed-cup flash point of less than -180°C
3.2 A liquid with a closed-cup flash point greater than -180°C but less than 230°C (for international air transport, the flash point is greater than 23°C but less than 60.5°C) (for international marine transport, the flashpoint is greater than 23°C but less than 61°C)
3.3 A liquid with a closed-cup flash point greater than 230°C but less than 37.8°C (for international air transport, the flash point is greater than 23°C but less than 60.5°C) (for international marine transport, the flash point is greater than 23°C but less than 61°C)

Class 4. Flammable Solids, Substances Liable to Spontaneous Combustion, and Substances that in Contact with Water Emit Flammable Gases

4.1 A solid which under normal condition of transport is readily ignitable and burns vigorously and persistently or which causes or contributes to fire through friction or from heat retained from manufacturing or processing.
4.2 A substance liable to spontaneous combustion under normal conditions of transport or when in contact with air, liable to spontaneous heating to the point where it ignites.
4.3 A substance that, on contact with water, emits dangerous quantities of flammable gases or becomes spontaneously combustible on contact with water or water vapour.

Class 5. Oxidizing Substances and Organic Peroxides

5.1 A substance which causes or contributes to the combustion of other material by yielding oxygen or other oxidizing substances whether or not the substance itself combustible.
5.2 An organic compound that contains the bivalent"-O-O-" structure, which is of
strong oxidizing decomposition or is sensitive to heat, shock or friction.

Class 6. Poisonous Substances and Infectious Substances

6.1 A solid or liquid that is poisonous through inhalation of its vapours, by skin contact or by ingestion. (Oral LD50 for solid < 200 mg/kg, and for liquids < 500 mg/kg).

6.2 Organism that are infectious or that are reasonably believed to be infectious to humans or to animals and the toxins of such organisms.

Class 7. Radioactive Materials

Radioactive materials with activity greater than 74 kBq/kg

Class 8. Corrosive Substances

A substance that causes visible necrosis of skin corrodes steel or non-clad aluminium.

Class 9. Miscellaneous Dangerous Goods

9.1 A substance or product presenting danger sufficient to warrant regulation in transport but which can not be ascribed to any other class.

9.2 A substance posing a long term hazard to man or the environment via chronic exposure. (i.e., Carcinogenic, teratogenic, mutagenic, persistent and aquatic toxic)

There has not yet been any criteria for chronic and long term health and environmental hazards.

Other important attempts have been made to identify and classify such hazards. The identifications of their negative effects are of very various in kinds, the depicted chart hereunder is according to the fire hazards of the materials. (Fire, 1986:384)
<table>
<thead>
<tr>
<th>Signal</th>
<th>Identification of Health Hazard</th>
<th>Identification of Flammability</th>
<th>Identification of Reactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Materials which on very short exposure could cause death or major residual injury even though prompt medical treatment were given.</td>
<td>Materials which will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature, or which are readily dispersed on air and which will burn readily.</td>
<td>Materials which in themselves are readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.</td>
</tr>
<tr>
<td>3</td>
<td>Materials which on short exposure could cause serious temporary or residual injury even though prompt medical treatment were given.</td>
<td>Liquids and solids that can be ignited under almost all ambient temperature conditions.</td>
<td>Materials which in themselves are capable of detonation or explosive reaction but require a strong initiating source or which must be heated under confinement before initiation or which react explosively with water.</td>
</tr>
<tr>
<td>2</td>
<td>Materials which on intense or continued exposure could cause incapacitation or possible residual injury unless prompt medical treatment is given.</td>
<td>Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.</td>
<td>Materials which in themselves are normally unstable and readily undergo violent chemical change but do not detonate. Also materials which may react violently with water or which may form potentially explosive mixtures with water.</td>
</tr>
<tr>
<td>1</td>
<td>Materials which on exposure would cause irritation but only minor residual injury even if no treatment is given.</td>
<td>Materials that must be preheated before ignition can occur.</td>
<td>Materials which in themselves are normally stable, but which can become unstable at elevated temperatures and pressures or which...</td>
</tr>
</tbody>
</table>
may react with water with some release of energy but not violently.

Materials which on exposure under fire condition would offer no hazard beyond that of ordinary combustible material.

Materials that will not burn.

Materials which in themselves are normally stable, even under fire exposure conditions, and which are not reactive with water.

In fact, there are actually myriad different kinds of chemical compounds that can be referred to as hazardous materials or dangerous goods. The number is increasing over time as ten to twenty thousand new chemicals developed yearly and around two thousand of these entering the stream of commerce. Most hazardous materials-incidents involve transportation. A transportation accident will most probably provide contact with such materials. The problems of releases of dangerous goods might be attributed to possible undesirable effects they cause both to human health and lives, property, and environment. They also carry the chronic and long term effects of health and environmental hazards.

2.1.1 Chemical and Physical Effect

The chemical and physical impact of dangerous goods discharges depends basically on their kinds and quantity and the reactivity and quantity of what they are exposed to.

Side effects which might accompany, particularly large discharges of dangerous goods are (among other things): (1) impact on the exchange of gases when it is spilled into the water in the water/air interphase, being vital for biological processes
The increased of temperature in the water because of energy released by chemical processes of the discharges and the water which can also form compounds tending to absorb excessive solar heat; (3) The toxic properties on the water surface and in the sea water affected by the spills affecting marine organisms.

2.1.2 Biological Effects

Biological processes can be upset by the discharged hazardous materials. The damaging effects caused by the discharges on marine organisms vary considerably. The following factors are of importance: type of substances discharged, notably its toxic content, concentration and amounts of the dangerous component of the discharged plus duration of exposure, condition of the discharge whether it is dissolved or adsorbed; nature of chemical and physical changes of the discharged, organism likely to be affected; phytoplankton, zoo-plankton, and higher level of biota, life cycle of the organism; young or mature stages, season relative to yearly cycle of the organisms; resting period, reproductive period, nature of the area, combatting method applied, and other sources of the contamination on the ecosystem.

Some discharges of dangerous goods may enter into the body of the marine organism which results in the reduction of the ability of the given organism in tracing the food, avoiding its predator, or even reproductive capability. Many of such discharged will stay in or be excreted out of the said organism in either the same or other forms carrying more or less dangerous characteristics and can generate negative impact both to the environment or to other organisms subject to the penetrations of the excreted. This hazardous properties can be seriously destructive to a human being, for instance when he consumes fish or other sea food containing high level of mercury.
2.2 Environmental and Economic Impacts

2.2.1 Impacts on the Ecology

Spills of hazardous materials have three major effects on the aquatic ecosystems: (1) they destroy part or all of the indigenous biota; (2) they impair ecosystem function in a variety of ways such as the destruction of the habitat, elimination of organism, and chemical-physical effects; (3) they place the ecosystem in disequilibrium, an effect that may be extended if persistent residual poisons remain.

2.2.2 Impacts on the Recreation and Economy

Recreational use of the port areas and tourism can be affected by the discharge of dangerous goods into the water. Economic damage can be predicted when the discharges occur prior to the tourist season. Impact can be long term and short term depending on the time needed to restore the water quality and surrounding affected environment to their previous stage.

Direct costs presents when associated with the physical damage from collision, explosion, fire, loss of cargo, clean up and restoration. Indirect costs can be associated with the closing or restricting affected zones of temporarily limited or prohibited access.

Vessel transit in the affected area may be temporarily controlled, restricted or prohibited. Restricting waterborne activities at port facilities and/or marinas may affect many segments of the local and regional economy.
Recreational and commercial use of waterfront facilities in ports may be impaired by persistent smell or unsightliness.

Risk of fire hazards causing by dangerous goods spills may require the temporary restriction or prohibition of spark-generating activities causing temporarily economic losses.
International cooperative endeavours worked under the United Nations, i.e. "Transport of Dangerous Goods. Recommendations of the Committee of Experts on the Transport of Dangerous Goods" to create the safe transport of dangerous goods is oriented toward the development of the world-wide uniformity of safety precautions in the transport of dangerous goods as a common basis for the different modes of transport by standardizing minimum requirements applicable for the transport of dangerous goods by all modes in the forms of international conventions and other international instruments which enable governments to control over shipping practices of dangerous goods and to respond adequately to dangerous goods accidents.

Formerly these conventions and other international instruments mainly deals with the safety aspect, today however they incorporate environmental concerns as well in the light of the concept of sustainable development. In this chapter these basic International conventions and other international instruments will be discussed, followed by the description of present Indonesian Legislation, and Local in-house port of Surabaya.
3.1 International Conventions and other Instruments

3.1.1 The International Convention for the Safety of Life at Sea (SOLAS), 1974

Chapter VII of SOLAS 1974, namely Carriage of Dangerous Goods, regulates and contains provisions for the ships carrying dangerous goods. It embodies mandatory requirements and provides necessary legal basis for international and national regulation for the transport of dangerous cargoes by sea. Amendments to the Convention concerning this matter have been done in 1981, 1983, 1989, and 1994. The revised Chapter VII as amended in 1994 applies to all ships the Convention applies to, including cargo ships of less than 500 tons gross tonnage.

Under Regulation 1 of part A chapter VII of this Convention, the carriage of dangerous goods by sea is prohibited except when they are carried in accordance with the provisions of the SOLAS Convention, and each Contracting Governments is required to issue, or cause to be issued, detailed instruction on safe packing and stowage of dangerous goods which shall include precautions necessary in relation to other cargo.

Regulation 2 of part A chapter VII of SOLAS 1974 (as amended) gives a framework of classification for dangerous goods. This fundamental classification of dangerous goods as contain in this regulation in its most updated version stands as follows:

Class 1 - Explosives
Class 2 - Gases: compressed, liquified or dissolved under pressure
Class 3 - Flammable liquids
Class 4.1 - Flammable solids
Class 4.2 - Substances liable to spontaneous combustion
Class 4.3 - Substances which, in contact with water, emit flammable gases
Class 5.1 - Oxidizing substances
Class 5.2 - Organic peroxides
Class 6.1 - Poisonous (toxic) substances
Class 6.2 - Infectious Substances
Class 7 - Radioactive materials
Class 8 - Corrosives
Class 9 - Miscellaneous dangerous substances and articles, substances not
fallen under other classes but experience has shown, or may show, to be
of such dangerous character that the provision of the Part A Chapter VII
of this Convention, as amended, should apply.

Regulation 3, 4, 5, 6, 7, and 7-1 of Part A Chapter VII of the Convention, respectively
deal with provisions of packaging of dangerous good, marking, labelling and
placarding of dangerous goods, the required documents, stowage and segregation, the
carriage of explosive on board passenger ships, and reporting of incidents involving
dangerous goods. Regulation 7-1 requires that the loss overboard of dangerous goods
to be reported to the nearest coastal State.

The above regulations give only the basic provisions, therefore they are very general.
The practical application of those provisions on board ships and in ports demands a
much more detailed concerning the provisions. In this case, the Convention clearly
recommends to refer to The International Maritime Dangerous Goods (IMDG) Code.

Concerning regulation 7-1 reference is made to IMO resolutions which outlines
procedures for doing so.
3.1.2 International Maritime Dangerous Goods (IMDG) Code

In order to have a uniform international comprehensive definition of the basic
definition given in enforced International Conventions concerning the carriage of
dangerous goods on ship by sea, for practical purposes, International Maritime
Organisation (IMO) adopted International Maritime Dangerous Goods (IMDG)
Code in 1965.

It covers such matters as classification, labelling, packing, container traffic and
stowage, with particular reference to the segregation of incompatible substances.
Since then the Code has been revised many times in line with the demands resulted
from the changes in the number and varieties of dangerous goods as well as the
methods and technology of the transport of dangerous goods by sea.

IMDG Code does not define dangerous goods in strict scientific sense, rather it
provides the detail classifications of dangerous goods on the type the risk involved
according to technical conditions of maritime transport. It aims at providing general
guidance as to which goods are dangerous and as to the class in which, according to
their characteristics, they should be included.

Threshold limit has been established, and substances are offered for transport tested
according to testing specification and procedures within the internationally accepted
criteria. If they fall under any one or more of the classess, their transport has to be
carried out under the established regulations.

Previously the concern of this code is merely on the safety of lives, property, and
ships at sea. In its developments it includes as well the marine pollution aspects.
The main classification of dangerous goods in this Code is basically the same as that given in the SOLAS 1974 Convention, except in class 9: Miscellaneous dangerous substances and articles, IMDG includes "Marine Pollutants".

The provision contained in this Code are applicable to all ships to which the SOLAS 1974 as amended applies when carrying dangerous goods classified under regulation 2 part A of Chapter VII of the Convention.

All ships, irrespective of type and size, carrying substances, materials or articles identified in this Code as marine pollutants are subject to the provisions of this code.

Although designed primarily for mariners, the provisions of this Code affect a number of industries as well as storage, handling, and transport services from manufacturers to consumers. Chemical and packaging manufacturers, packers, shippers, forwarders, carriers, and terminal operators are guided by its provisions on classifications, terminology, identifications, packing and packaging, marking, labelling, and placarding, documentation and marine pollution aspects. Feeder services such as road, rails, harbour and inland water craft are guided by its provisions. Port authorities, terminal and warehousing companies consult the IMDG Code to segregate and separate dangerous cargoes in loading, discharge and storage areas.

In each of the class identified in the code, substances, materials, or articles are identified in the individual schedule according to their type of risk to sea transport as has been designated, together with their proper names, UN number and No of emergency schedule. Class of packaging, the provision for marking and labelling, methods of documentation, stowage, and reporting of incidents are also included. Some substances under classes 1-8 which are considered harmful to the marine environment are identified as "Marine Pollutant". Class 9 cover those substances having the same characteristics but not covered by any other classes.
Considering the above discussion the inclusion of the marine pollutant in the IMDG Code is one step ahead toward the integration of the classification systems which cover both the safety and pollution aspects operationally in global terms which is the basic of the interpretation of the precise meaning of the dangerous goods defined by Both MARPOL 73/78 and SOLAS 74.

This will promote the application of both Conventions by the Maritime Administrations in more or less the same way of enforcement so that Port state Control functions can be better applied and done in a global cooperative manner.

3.1.3 The International Convention for the Prevention of Pollution from Ships, 1973 as modified by the protocol of 1978 relating there to (MARPOL 73/78)

MARPOL 73/78 is the most ambitious international treaty covering maritime pollution ever adopted. It deals not only with oil but includes all forms of marine pollution except the disposal of land-generated waste into the sea by dumping.

Most of the technical measurers are included in five of its annexes which deal respectively with the following:

- **Annex I** - Oil
- **Annex II** - Noxious liquid substances carried in bulk (e.g. chemicals)
- **Annex III** - Harmful substances carried in packaged form (e.g. tank and containers)
- **Annex IV** - Sewage
- **Annex V** - Garbage
The status of the Annexes and their entry into force date are shown below.

Table 2: Annexes of MARPOL 73/78 and Date of Enforcement

<table>
<thead>
<tr>
<th>ANNEX</th>
<th>STATUS</th>
<th>ENTRY INTO FORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annex I</td>
<td>Mandatory</td>
<td>2 October 1983</td>
</tr>
<tr>
<td>Annex II</td>
<td>Mandatory</td>
<td>6 April 1987</td>
</tr>
<tr>
<td>Annex III</td>
<td>Optional</td>
<td>1 July 1992</td>
</tr>
<tr>
<td>Annex IV</td>
<td>Optional</td>
<td>not yet enforced</td>
</tr>
<tr>
<td>Annex V</td>
<td>Optional</td>
<td>31 December 1992</td>
</tr>
</tbody>
</table>

Among these five Annexes of the Convention, Annex III deals with marine pollution from harmful substances carried in packaged form or dangerous goods.

Annex III of the MARPOL 73/78 as amended made reference of dangerous goods harmful to marine environment to the IMDG Code. As a consequence had to be revised to include marine pollutant within its existing classification system. This is dealt with by adding new Section 23 in the Code. Under this amended Annex, the reference to the IMDG Code is mandatory.

The basic criteria for the definition of harmful substances to the marine environment, which later on called “Marine Pollutant” is provided in the “Hazard Profile” worked out by Group of Experts on Scientific Aspects of Marine Pollution (GESAMP).

In the IMDG Code, these substances, materials, or articles are identified in the individual schedule as “Marine Pollutant”. Those which are identified as marine pollutant without possessing any other hazard are listed in the appendices to the schedules for ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O., UN No.3077, or ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S, UN No. 3082 in class 9. Solutions, mixture and isomers are treated differently and not listed in the appendices.
This section also deals with documentation, marking, stowage, and reporting of incidents of marine pollutant.

The revision of Annex III of MARPOL 73/78 make it obligatory for the ratifying Countries to take precautionary measures for the transport of environmentally harmful substances by sea as set out in the IMDG Code as amended.

3.1.4 The International Convention on Oil Pollution Preparedness, Response and Cooperation. (OPRC), 1990

OPRC 1990 concerns with the international cooperation for oil pollution preparedness and response. This Convention however is intended to be expanded to such cooperations in dealing with marine pollution caused by hazardous and noxious substances as it is stated in resolution 10 of the Convention.

The draft of the Protocol has been prepared and discussed in the MEPC 38. This can be considered to be a very important step to the Government of the OPRC 1990 parties to give enough attention to the management of dangerous goods and initiate the formulation of the necessary policy to deal with the requirements of this intended Protocol. drawing the experience from important points of the existing OPRC 1990 Convention as follows.

• that under OPRC Convention shipboard oil pollution emergency plan is as one required under Regulation 26 of Annex I of MARPOL 73/78

• that states will require of-shore unit operators to develop oil contingency plan, which are to be coordinated with the national system
• that states may require the authorities or operators of such sea ports and oil handling facilities under its jurisdiction as it deems appropriate

• that states require masters of ships flying their flags and operators of off-shore units, port oil handling facilities operator under their jurisdiction to report without delay any event involving a discharge or probable discharge of oil, whether on their ship or unit, respectively, or observed at sea

• that the convention requires each state to establish a national system for responding promptly and effectively to oil pollution incidents, which includes:
  - designation of a competent national authority, the national operation contact points to be responsible for receipt and transmission of oil pollution reports, and an authority entitled to act on behalf of the state to request or decide to render assistance;
  - a national contingency plan, including the relationship of the various body involved taking into account guidelines in the Manual on Oil Pollution, Part II Contingency Planning.

• Each state is to establish individually or through international cooperation and as appropriate in cooperation with other public or private parties:
  - a minimum level of a-prepositioned oil combatting equipment, commensurate with the risks involved, and program of its use;
  - a programme of exercises for oil pollution response organisation and training of relevant personnel;
  - a mechanism or arrangement to coordinate response including, if appropriate the capabilities to mobilize the necessary resources.

• that each state must ensure the current information to be reported to IMO concerning:
- location, telecommunication data, areas of responsibility of the competent authority, and authority empowered to act;
- pollution response equipments and expertise which may be made to other states upon requests;
- its national contingency plan.

that contracting states agree to cooperate and provide advisory services, technical support and equipment upon request of a state effected or likely to be affected by oil spill it can not deal with alone.

3.2 National Legislation

All maritime activities in the territory of the Republic of Indonesia is legislated by National Law, which can be in the form of an Act or a Presidential Decree. This Law then to be further elaborated in Governmental Regulations. for its implementation in each intern Department under a Ministry, it will be adopted by Ministerial decree.

In case of sea transport and ports in Indonesia, it is carried out by the Directorate General of Sea Communication under the Ministry of Communication, the Director General of Sea Communication is authorized to issue decree of the Director General of Sea Communication or Circular which is considered necessary to facilitate the execution of the duties of the Directorate General of Sea Communication.

The Latest Act of Sea Transport and Port activities in Indonesia is “UNDANG-UNDANG REPUBLIK INDONESIA NOMOR 21 TAHUN 1992 TENTANG PELAYARAN” or can be translated as “Act of the Republic Indonesia No. 21 Year 1992 on Shipping”
Under this new Shipping Act, the provision of the transport of specific or dangerous goods is legislated under article 87 (1),(2) Part XI Chapter IX under the heading of “Pengangkutan barang Khusus dan Barang Berbahaya” or can be translated into “Transport of Specific and Dangerous Goods”. It is stated in (1) that transport of specific or dangerous goods is obligated to meet requirements, and (2) that the provision mentioned in (1) will be further regulated by a Government Regulation.

The problem is that so far the Government regulations is not yet ready and is still in the process of approval in the parliament.

However in the absence of Government regulations, The Directorate General of Sea Communication has responded to the needs of regulating the management of transport and handling and storage of dangerous goods in ports by the Circular of the Director General of Sea communication No. UM.482/1/5/DII-90, 12 January 1990 on the Guidance for the handling of Dangerous Goods Transported by Sea.

The Circular was written on the basis of International regulations and National Regulations. The International Regulations adopted are the provision in SOLAS 74 which was ratified in 1980 by the Indonesian Government, IMDG Code, the Bulk Chemical Code (BCH), International Bulk chemical Code (IBC), and STCW 1978. And MARPOL 73/78.

The national regulations are Harbour Regulations 1925 as revised, Ship Ordonant as revised, Oil Transport Ordonant and Oil Storage Ordonant 1927, Regulations on Explosive and Fire Gun 1893, Fire Works Ordonant 1927, Regulations on Coal Stowage 1913, and the Decree of the Director General of Sea Communication No. DPP.87/L/13, 11 March 1981 on Joint Operation for Facilitation of Sea transport and Sea Ports Operations.
The Guidance contained in the circular discusses in very brief and very general the dangerous goods classifications, packing, marking, labelling, documentations, storage, and segregation.

A discussion about explosives on board passenger ships as well as fire precaution is also given in brief. The Guidance ends with the section on loading and unloading of dangerous goods in transport as illustrated in the IMDG Code.

3.2.1 Presidential Decree

Concerning the legal basis for the provision of Contingency planning there has not yet been any discussion dealing with contingency planning for dangerous cargo. However the Draft of Presidential Decree for national oil contingency plan has been developed in 1992 in which responsibilities, competence, and task with respect to oil spill preparedness and response in Indonesian waters are defined in main lines.

The structure of the organisation and the composition of response teams nationally, regionally, and locally is described. The functionarists involved will be nominated by the ministries and Agencies concerned. The Directorate General of Sea Communication is proposed as the executing Agency in charge of actual combatting.

The national team is responsible for handling large level incidents unable to be settled at local or regional level. The regional teams are in charge of handling the medium level incidents which can not be finished at local level. And the local teams are responsible for handling the small incidents in local area.
3.3 Authorities and Responsibilities

According to the Draft of the Presidential Decree mentioned earlier, the minister of communication as responsible for the organisation of physical control over the marine emergency situation, while the Head of the Agency for Environmental Impact Control is in charge of the control over the environmental impact and rehabilitation of the environment.

The Draft Decree includes an indicative list of ministries and other organisations, public or private, with whom the Minister of Communication is to coordinate, and these organisations are instructed to immediately give the support requested. The Head of the Agency for Environmental Impact Control is given the same responsibilities and authority to ask cooperation from relevant agencies/organisations.

The Minister's responsibility and authority to maintain physical control over the emergency situation is delegated to the Head of the Regional (i.e. province) Office of the Ministry of Communication in accordance with each territorial jurisdiction. The latter will maintain coordination with other related agencies and organisation in the given jurisdiction.

At the local level, the actual physical control over the situation is in the hand of Port Administrator or Head of the Port Office within the working area of the Regional Office of the Ministry of Communication and maintain the coordination with the other related agencies and organisation in the given jurisdiction.

The control procedure in the Draft Decree requires that reporting of an incidents to be notified to Port Administrator or Head of the Port Office, or the National Operation Centre in The Directorate General of Sea Communications.
The Port Administrator or Head of the Port Office evaluates the reported incidents, forward in to the Head of Regional Office of the ministry of Communication, and takes control actions.

In the event that the mobilised resources are not enough to control the incidents notification is given to the Head of Regional Office of the Ministry of Communication who may direct additional resources. If this is not enough he will notify the minister of Communications and the Head of the Agency for Environmental Impact Control. On the notification, the latters may mobilize national resources and possibly international assistance. In this case the latters take over the responsibilities.

To implement this procedure, the Minister of Communication is to take inventory of resources available, establish requires lines of coordination in a standing procedures Minister furthermore has to establish a reliable response organisation, complete the equipment of the National Operation Centre, coordinate provision and preparation of oil spill control facilities and equipment, and coordinate settlement of finance implications.

The Minister of Communications is to identify the areas with high risk of shipping accidents, while the Minister of the Environment will identify the areas where the marine environment is likely sensitive to the pollution.

The Head of the Agency for Environmental Impact Control is to take inventory of the available resources, establish lines of communications with all organisations, develop standing procedures for controlling environmental impact, and coordinates the emergency control measures to limit the impact and rehabilitate marine environment.
The agencies listed in the Draft Decree and other organisations involved by both the Minister of Communication and the Head of the Agency of Environmental Control are to develop guideliness for the mobilisation of their resources in accordance with the designated standing procedures.

Each Head of Regional Office of the Minister of Communication, in cooperation with related parties are to develop a standing procedure for alertness and joint operations to control the incidents. He is authorized to ask necessary from whatever resources available in his jurisdiction, particularly from the relevant organisation designated in advance. He will also have to provide a general guideliness and will appoint Port Administrator or Head of Port Office to execute control to lead the control operation.

To improve the alertness to control emergency situations, the Minister of Communications is to organize periodic joint drills.

3.4 Local in House Rules

There is not any local port regulations has been formalised on the transport of dangerous cargoes in port area, neither is for local contingency planning.

The only existing rules are in the form of a circular issued by the Port Administrator of Surabaya Port.

The circular regulates the handling of explosives in port of Surabaya. It is a circular No. HK.506/02/02/Adpl.Sba.96 "Penanganan Barang Berbahaya mudah Meledak (explosives) in Port of Tanjung Perak Surabaya. Issuance date of the circular was 26 April 1996.
The circular is addressed to all port users and concerned authorities involved in the handling of explosives the port. The intended port users include cargo owner, shipping company/agent, stevedoring company, freight forwarder, goods producer, and ship master.

It states that all explosives handled in the port should be:
- named properly according to appropriate technical names;
- categorised according to their classification categorization;
- numbered with the correct UN number;
- mentioned of its compatibility;
- mentioned of its types, total packing numbers;
- mentioned of its side effects.
- packaged properly with inner and outer packaging.

Further it rules out that the loading and unloading of explosives must be done by truck lossing system. It is not allowed to be stored in warehouses or any places within the port.

For supervising and monitoring the loading and unloading of explosives have to be witnessed by ship crew, personnel of Port Administration Office(Coastguard Officers), Police, and representatives of port fire brigade. All appropriate fire equipment have to be made available within vicinity.

Activities of loading-unloading are not permitted when raining. The activities is done at the night time only by a specific permits from the Port Administrator.

The berthing position of the ship handling explosives have to be arranged so that it can manoeuvre freely. Stowage is to be done according to the instruction of the Port Administrator.
Some weaknesses of this circular as it is noticed by the author are that:
- it does not make a specific reference for the matters of marking, labelling, packaging, and so forth;
- some authorities are not addressed such as quarantine and customs;
- it does not define the line of authority and responsibility.

The copy of the issued circular is in the appendix 1.

The more elaborate discussion on the handling of dangerous goods in the port will be discussed in chapter V.
4.1 Discharges

Discharges of dangerous goods refers to its releases into the sea port area or its surrounding marine environment which may be resulted either from the operational mistake during loading-unloading, transferring, storage or accident at sea involving ship(s) carrying dangerous goods. These discharges may give different hazards to the human, properties, and environment depending among other things on the amount, kinds, sensitivity of the location exposed to, and the natural conditions of the weather. This will determine the category of the discharges and eventually the response actions to be taken.

This chapter is almost entirely written on the basis of the material presented in the seminar “Response to accidental Chemical Spill at Sea” conducted from 10-15 April 1989. The materials are:
- Behaviour and Fate of Chemicals accidentally Spilled at sea by R. Kantin
- Major Classification for Hazardous Substances by R. Kantin
- Pollution Response for Chemicals which Evaporate, Mix with Water or Sink by R. Kantin
- Treating Floating Chemicals (Dispersants, Sorbants, Gelling Agents, Chemical Foam by F Merlin
- Behaviour/Accidental Situations - Gas Clouds by W Koops
- Floaters
4.1.1 Discharges Categories

In order to determine the extent of the response action to be taken upon the detection of dangerous goods discharges, it is necessary to describe categories of the discharges based on types, extent, and location.

Definitions

IMO's Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas states that dangerous cargoes means any of the following cargoes, whether packaged, carried in bulk packagings or in bulk within the scope of the following regulations:

- oils covered by Annex I of MARPOL 73/78;
- gases covered by the Codes for the Construction and Equipment of Ships Carrying Liquified Gases in Bulk;
- noxious liquid substances/chemicals, including wastes, covered by the Codes for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk and Annex II of MARPOL 73/78;
- dangerous, hazardous and harmful substances, materials and articles, including environmentally hazardous substances (marine pollutants) and wastes, covered by the International Maritime Dangerous Goods Code; and
- solid bulk material possessing chemical hazards and solid bulk material hazardous only in bulk (MHBs), including wastes, covered by Appendix B of the Code of Safe Practice for Solid Bulk Cargoes.

However for the purpose of the dissertation, oil is excluded from the definitions used throughout the work.
Further it explains that the term dangerous cargo covers also any empty ex-
dangerous cargo containments or packagings unless they have been adequately freed
from residue of dangerous cargoes and from vapours so as to nullify any hazard or
have been filled with a non dangerous substance.

While the term "Dangerous Goods" refers to those cargoes which pose a defined
hazard to life, environment or property and which are packaged, unitized, in
containers or in tanks. (Brunings, 1996:1,3)

In their proper original containments for safe transport, dangerous goods might be in
the form of gaseous, liquified gas, liquid, or solid. If however these dangerous goods
escape from their containments, they might in contact with other things or energy
they encounter or are exposed to. The contact can be with air, water, metals, heat,
and other substances. Depending on the physical and chemical properties of the
released dangerous goods, it may react in such a way that the products of the
reaction(s) during or at the end of the process give off hazards to human, other living
things, environment as well as properties.

Classifications

Ideally the classifications of dangerous goods discharges should cover all of the
aspects mentioned. In reality this is difficult to do, rather there are several
classifications, with different points of priorities. Ones might give the classifications
with putting more concern to pollution aspects, other may pay more attention to
safety aspects.

For emergency response purposes, however, those all aspects should be covered,
attention to be given carefully to those strengths and weaknesses of any
categorizations, complimentary used are to be incorporated so that the information of
the type of risk involved and extent to its effect to people, environment, and properties can be drawn as careful as possible and contingency plans to be worked out accordingly.

The types of dangerous goods discharges therefore are to be defined from the existing categorisations or classifications, which can be identified into two main groups, namely those designed in the framework of international regulations, and other operational classifications. (Kantin 1989:1)

The first are those classifications according to International Regulations includes those of SOLAS 74, MARPOL 7/78, and IMDG Code, IBC/IGC, BC, and GESAMP.

From these classifications, type of dangerous goods discharge may be put into table which is easy to read and use for dangerous cargo handling management, an example is given below

Table 3: Example of Combined Classifications from International Categorizations of Dangerous Chemicals

Name : STYRENE (UN 2055)

<table>
<thead>
<tr>
<th>IMDG Class</th>
<th>3.3 /Pollutant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaging Group</td>
<td>2</td>
</tr>
<tr>
<td>MARPOL Classification (Annex II)</td>
<td>B</td>
</tr>
<tr>
<td>IBC (type of ship)</td>
<td>2</td>
</tr>
<tr>
<td>GESAMP Category :</td>
<td>Col. A T</td>
</tr>
<tr>
<td></td>
<td>Col. B 2</td>
</tr>
<tr>
<td></td>
<td>Col. C 2</td>
</tr>
<tr>
<td></td>
<td>Col. D II</td>
</tr>
<tr>
<td></td>
<td>Col. E XX</td>
</tr>
<tr>
<td>Remark</td>
<td>carcinogen</td>
</tr>
</tbody>
</table>

This information gives the emergency response personnel a basic knowledge regarding:
The second group refers to the classification systems other than those of International ones but is necessary in that it deals with considerations important to be provided in order to use prediction models and permit an estimation of nature, extent, and duration of risks. The systems cover the risks of fire, toxicity, reactivity, and danger to human being. Some concern also with physico chemical behaviour of a chemical (or pollutant) in the event of an accidental spills.

The following gives brief description and examples of such systems as adopted by The U.S. National Fire Protection Association (NFPA), The National Academy of Sciences in the United States (NAS), the Geneva fire-fighters (Sapeurs-Pompiers Genevois-SPG), Intervention Guide Classifications, and Bonn Agreement Working Group - Operational, Technical and Scientific Questions Concerning Counter Pollution Activities (BAWG-OTSOPA) Classification.

NFPA Classification uses a diamond shape to present information on dangerous substances for four risk profiles, ie risks for health, fire, reactivity, and specific risk. Degree of risks from highest to lowest are coded from 0 to 4 respectively. Risk of health is in blue on the left, risk of fire is in red at top, Risk of unstability and reactivity with water is in yellow on the right, specific risk is put at the bottom with remarks.

Applying this system, Calcium Carbide can be described in the following figure.
Figure 1: Example of NFPA Classification on Calcium Carbide

Name of Substance: Calcium Carbide

**FLAMMABILITY**

- “very high risk”-substance
- very flammable and forms explosive mixtures.

**HEALTH**

- (low risk)

**REACTIVITY**

- (moderate risk) Unstable but not explosive. Can form explosive mixtures at water contact.

Avoid water contact

NAS establish the level of danger of risks of fire, health, water pollution and reactivity. To give an example on the work of this classification system, application to Styrene is described. Level of danger of risk, from the highest to the lowest, coded from 0 to 4 accordingly.

Name of Substance: Styrene

- Fire

- Health
  - irritation caused by vapour
  - irritation caused by chemical (liquid or solid)
  - intoxication

- Water pollution
  - toxicity for man
  - toxicity for life forms in the aquatic environment
  - esthetic damage to the environment

- Reactivity
  - other chemicals
  - water
  - spontaneous reaction

35
SPG states the amount of various dangers of substances into a scale with different colours for different risks - health (blue), fire (red), chemical instability with heat (yellow), water reaction (white), formation of explosive mixtures with air (red and yellow) - each of which encoded from 0 to 4. A danger is increasing with the increase of encoding number. One example is shown below.

Figure 2: Example of SPG Classification for Styrene

| 2 | 3 | 2 | 0 | 2 |

Health  Fire  Heat  Water  Explosive

Instability  Reaction  Mixture

Intervention Guide Classifications produced by America, Canada, and some others classified chemicals into about 50 families in terms of the emergency actions whether it is to stop the spill or insure emergency rescue.

To use this guide it is only necessary to find the name of the chemical or its U.N. number in the index and then to find the file which corresponds. Each file is based on a classification according to the risk profile of the chemical and the emergency measurers to be put into action.

One example of these is Emergency Guide for Dangerous Goods produced by CANUTEC, Minister of Supply and Services Canada in 1982. It describes 1283 chemicals accidents emergency response guide.
The U.N numbers of the substances are put in numerical index pages, which contain also the names of the chemicals and number of guide to refer to. There are 71 guides compiled in Hazard Pages. One Guide may be used for many different kinds of chemicals possessing similar hazards.

Each Guide provides information concerning potent hazards for fire or explosion, health, Emergency action information and what to do for big and small fire or spills. It also indicates First Aid to be taken.

There is also Table of Isolation and Evacuation Distances for initiate isolation and evacuation from small spills (drum, smaller container, or small leak from tank) or from large spill from a Tank (or from many containers, drums, etc.)

To help decision making for implementing pollution response, BAWG-OTSOPA categorizes the chemicals and their reaction products according to their ability to evaporate, float, dissolve, and sink, whether liquified (gaseous at ambient temperature), liquids or solids, as well as packaged chemicals. Different from previous systems discussed, this classification ignores risk profiles and simply divides chemicals according to their short term (a few hours) behaviour in case they spilled at sea.

The short term behaviour will include the chemicals' spreading over the water surface, evaporating, dissolving or mixing with water, sinking or multiplication of such behaviours.

The European standard classification system is based on the physico-chemical behaviour of substances and designed to better organize emergency actions and to understand the adapted pollution methods can be used.
According to the classification, gases may have some distinct behaviours in sea water. First, there are gases which dissolve very little or not at all. Such gases evaporate immediately ("flash evaporation"), such as butane and methane.

Second, other gases may readily dissolve in seawater for instance ammonia and ethylene oxide.

However a liquified gas in very deep water may be decreased of or lose its volatilization due to hyrostatic pressure. Gas like dichlorofluoromethane, for example, will not volatilize at all at the depth of 80 metres.

For the first and second cases the emergency pollution techniques are somewhat similar, despite the differences in the weights of gases relative to that of air.

The behaviours of liquids in seawater are more diversified than those of gases. There are liquids which evaporate very immediately, coded as "E", for instance benzene, isoprene.

Liquids which evaporate quickly and dissolve easily are coded as "ED" such as methyl methacrylate and propylene oxide.

Liquids which float and simultaneously evaporate and dissolve are coded as "FED", for examples methylisobutylketone and butyl acrylate.

Liquids which float and simultaneously evaporate but have no or only weak evaporation or dissolving properties, encoded as "F" such as vegetable oils and noninphenol.
Liquids which float and dissolve relatively quickly, encoded as “FD” for examples aniline, adiponitrile

Liquids which dissolve quickly and which can easily evaporate but where the property of dissolving is more important than that of evaporation, encoded as “DE”, such as acetone and methanol.

Liquids which dissolve very rapidly, encoded as “D” such as hydrogen peroxide, and solutions of phosphoric acid and caustic soda.

Liquids which sinks but which have very weak or non-existent dissolving capacities, encoded as “S” for instances tetraethyl lead and dibutyl phthalate.

Solid substances may also share the similar behaviours with that of liquids with somewhat different in vaporization.

Solids which float with weak or non existent evaporation, encoded as “F”, an example is tallow.

Solids which float and dissolve rapidly, encoded as “FD”.

Solids which dissolve very quickly, encoded as “D”, an example is ammonium nitrate.

Solids which sink without dissolving or which have negligible dissolving property, encoded as “S”, such as napthalene and hexamethylene tetramine.

Solids which sink while dissolving, encoded as “SD”, for examples sodium chlorate and calcium chloride.
In case of the fate of packaged substances, the important parameters are: the characteristics of the substance, the characteristics of the packaging material, and the quantity of the substance in package.

Depending on the total density of the entire package, which is equal to package + content + air space, a package containing substances might sink, float on the water surface, or float between surface and bottom.

Packages with greater density than that of the seawater have a tendency to sink.

Packages with less density than that of the seawater will float up on the surface and may wash up on the coast.

Packages with more or less the same density as that of seawater will float in the middle or sink depending of the water mass fluctuations and could be stranded on the shore.

Notes:
- chemicals which immediately evaporate have a vapour pressure greater than 3 kilopascals
- chemicals which do not evaporate, or which have only a weak evaporation property have a vapour pressure less than 0.3 kilopascal
- product which dissolve immediately have a solubility greater than 5% for liquids, and 100% for solids
- solubility factor is significant if it is more than 0.1% for liquids and 10% for solids.
Important parameters in relation with the determination or prediction of the fate of the discharged dangerous goods/substance at sea are: density, solubility, vapour pressure, viscosity, surface tension, octanol/water partition coefficient, boiling point, solidification and sublimation.

More long term behaviour refers to the chemical's disappearance or to its removal from the aquatic ecosystem or to its accumulation. The processes will depend on the dispersion, degradation or other physical transformation, both chemical and biological which can take several days to years. Physico-chemical actions involved are photo-oxidation, photolysis, abiotic degradation, absorption, redissolution from sediment, etc.

Biological actions covering ingestion, excretion, regulation, bioaccumulation, biomagnification in the food chain, degradation by marine micro-organisms, and increase in nutrients which can be assimilated by primary producers (eutrophication).

The idea can be visualized in the following figure.

Figure 3: The Various Categories of Chemical Behaviour

Legend: G = gas
Endeavour to incorporate the various systems for the sake of safe transport, cargo handling, storage, emergency response and pollution control of dangerous goods discharges may be done in the following example.

Figure 4: Example of Incorporate classifications for DICHLOROBENZENE

<table>
<thead>
<tr>
<th>Flammability</th>
<th>Health</th>
<th>Reactivity</th>
<th>NFPA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Health 2 indicating moderately flammable chemical; heating may be sufficient for combustion thereby releasing volatiles.

-Code 2 on the left (NFPA) indicating moderate risks for human health; chemical may cause temporary incapacities and damage to organism.

-Code 0 to the right (NFPA) pointing out chemical is non-reactive; it is stable when exposed to fire.

(Source: Kantin, 1989)
- Empty square bottom (NFPA) judging water can be used for extinguishing fires.
- "A" (MARPOL Annex II) telling the substance is a marine pollutant, bioaccumulable by aquatic organisms which will present a risk to the aquatic environment and human health; their TLM is less than 1 ppm.
- Priority for recovery "2" suggesting the presence of threat of pollution or danger for human health and recovery to be made when technically and economically feasible.
- Letter "S" indicating that chemical sinks without dissolving or with only trace dissolving.
- Letter PS telling a package containing this chemical will sink to the bottom

Knowing these risks is of prime importance to the emergency response and pollution control people in order that they have somewhat basic valid considerations to be involved in determining the extent and the duration of the risks and find out reliable and reasonable techniques to be applied to response to such situations.

The writer however suggest that the classification worked out by NAS in terms of "esthetic damage to the environment" should also be incorporated in this classification to give the more rational approach to the port where there is an adjacent marine tourism activities prevailing.

**Quantity**

Dangerous cargoes carried in chemical tankers in various sizes ranging from 400 m\(^3\) to 40,000 m\(^3\), while the tanks size between 70 m\(^3\) to 2,000 m\(^3\).

Chemicals transported as packaged goods refers to those which are used in relatively small quantities but poses hazards. The forms of the packages are various in kinds, sizes, and capacities, namely bottles, cans and drums to tank containers.
The volume of dangerous cargo in one packaged covers inter alia very small and small receptacles (in limited quantities), cylinders (e.g. for gaseous substances) up to 1,000 litres, bags, boxes, cans, drums, etc. up to 450 litres, unit loads, intermediate bulk containers, tanks, road and rail vehicles, bulk packagings and other cargo transport units and shipborne barges. (Wardellman, 1995:1)

Amount of discharges of packaged dangerous goods, can be divided into two types according to the purposes for emergency responses for safety and pollution.

According to the purpose of response for safety, the following volumes described in the Guide to Emergency Response (1987) might apply.

Small spillage :
- solid < 1000 gr.
- liquid < 2.5 litres

Larger spillage :
- solid 10 Kgs.
- liquid 25 litres.

Spillages in excess of these values may require the assistance of the emergency fire, police, and ambulance services.

The effect and extent of such an incident could seriously affect the staff involved at the time, the general public living in the area, and the local and water authorities in charge of controlling effects of chemicals entering the drains and sewerage system and the treated effluents entering the rivers.
Concerning marine pollutant information originated from IMDG Code might be adopted as can be seen in its sections 7 and 8 (General Introductions), pollution markings requirements shall not apply to:

a. Packages containing marine pollutants in inner packagings with contents of:
   - 5 litres or less for liquids; or
   - 5 kg or less for solids; and
b. Packages containing severe marine pollutants in inner packagings with contents of:
   - 0.5 litres or less for liquids; or
   - 500 grammes or less for solids.

Location

The Location of the dangerous goods discharges in the port area is highly associated with accidental and deliberate discharges. Accidental usually occurs in a small scale such as leaking drums, broken packages, or mishaps during the handling in ports.

However, the majority of marine casualties occur in the approaches to or in port.

Accidental and deliberate discharging of dangerous goods might also happen in coastal area and the open sea.

It is easier to identify and response if chemical dangerous goods fall into enclosed water space than that in the open sea in regard of the influence of external factors to the movement of the discharges.
The enclosed water in port is necessary too be identified of their vulnerability and sensitivity toward dangerous goods discharged in order to worked out the contingency plan for dangerous goods discharges.

4.1.2 Fate of Discharges of Dangerous Goods at Sea.

The fate of discharges of dangerous goods at sea depends on how they behave. Their being reactive and non /slightly reactive nature encompass their distinct behaviour and yet their fates. Every chemical and every situation will result in a particular case, however there is a common ground for each specific situation.

Reactive chemicals can be traced out from how their reaction with the air (oxygen), reaction of the chemical with itself, reaction with water, and reaction with other chemicals.

Reaction of chemicals and oxygen will generally be accompanied by explosions, if the molecules contain reactive groups or “explosophores”. (Kantin, 1989:2)

The chemical reactions will be exothermic producing significant heat. The explosive reactions are oxidation reactions incorporating an organic reducer (the chemical) and oxygen (in air). A violent explosion will be generated from the stochiometric mixtures of oxygen and a combustible gas such as hydrogen or methane (or organic vapours).

To avoid this danger to happen, antioxydants are used to prevent the formation of explosive peroxides in the transport of certain chemicals such as isoprene, di-isopropilic ether, vinylidene chloride, sodium or potassium amide.
A Reactive gaseous chemical reacts with oxygen and creates explosion when only the proportion of their individual volumes in a mixture with air or oxygen falls within the range of certain limits. These limits will be different according to when a mixture is with oxygen in air or with pure oxygen. Methane, for example, has the range between 5.7% and 13.2% of its volume in air. In pure oxygen, however, this gas forms an explosive mixture if its volume is between 6% and 57.3%. To prevent explosion reaction to happen, the best way is to keep the volume of this gas below the low explosive limits (LEL).

For gases the danger zones extend beyond a certain distance from the spill site. (Kantin, 1989). He gives an example of a prediction model of 25 000 m3 of LNG. In the presence of fire, a slick of 800 metres in diameter will burn for several minutes and can cause damage up to 1 km from the site of the accident. The substance will create a slick of 1 km in diameter of and create a gas cloud 3 kilometres in diameter. The cloud can then burst into flame at contact with a second ship (cause a deflagration) or can be disseminated in the atmosphere.

For liquid, the danger zone greater than low explosive limit usually correspond to an area located above the slick.

For powders of all combustible substances are able to burn and to explode more or less violently.

The most spectacular explosion occurs when the oxidizing agent and the combustible are present in the same molecule such as ammonium nitrate. In explosive formulas oxygen is actually combined in the molecule.

Reaction within the chemical itself can be classified into polymerization and decomposition.
Polymerization is an addition reaction when two or more molecules (monomers) of the same substance combine together to create a new substance called polymer, which is usually a solid and has a heavy molecular weight. This reaction is isothermic and capable of becoming explosive when it continues to happen on the condition that the amount of the monomers are abundant, presence of catalyzer, absence of polymerization inhibitors and increase of temperature. The use of antipolymerization agents to inhibit the polymerization is necessary in the transport of styrene, acrylonitrile and many others substances with high polymerisation reaction capability.

Decomposition refers to the chemical reaction when a “mother” molecule breaks down into “daughter” molecules to become a more thermodinamically stable compound in response to slight heating or evolving of oxygen at ambient temperature by oxidizing substances. Transport applies stabilizing agent on cargoes such as benzyl chloride to avoid changing of the substance into hydrochloric gas.

Reaction of chemicals with water can be distinguished into two kinds, namely reactions of decomposition by water and reactions of combining with water.

Some chemicals reactions with water can be referred to as reactions of decomposition by water. Hydrolysis might be explosive. Other reactions may release heat and produce corrosive substances. Substances classified under class 4.3 of the IMDG Code when in contact with water releases flammable gases.

Several chemicals react with water. They dissolve and combine themselves with water producing heat and corrosive solutions. Oleum and chlorine are typical examples of such substances.
Certain chemicals are also known as very reactive with humidity in air which might cause spontaneous combustion, for examples white phosphorous, alkalis, some organometallic compounds and metallic hydrides.

Besides the reactivity of chemical with oxygen or water, reactive chemicals may react each other and might also result in an explosive and flammable mixtures. These chemicals can not be put together because they are incompatible and may react one another. Segregation system is needed for those substances which are considered incompatible.

The fates of discharges or spills or of non-reactive or only slightly reactive chemicals and their reaction products in any forms- solids, liquids and gases- can be analysed from their “short term” or “more long term behaviour”. The first one is on the order of several hours, and the latter can last up to several years. Those behaviours are of different phases, as described in the previous section.

4.1.3. Early Warning and Monitoring

4.1.3.1 Aerial Surveillance

When locating dangerous goods discharges in port areas, it might sometimes be necessary, in order to make a good preparation, conduct response actions and control of the operation activities to incorporate aerial surveillance. Helicopters can be used for this purposes. It is also necessary in the concern of timely measures to protect the endangered protected sensitive marine area and other legitimate uses of along the coastline, particularly when the weather is very heavy and wind blows onto the direction of coastline.
If dangerous goods slick is floater or in packaged forms with density about the same or less than that of seawater, it may be carried by the wind in certain speed and surface current also give effect to this movement. The strength and direction of tidal currents are also factors to be counted carefully.

Aerial surveillance might encounter difficulties when the colour of the dangerous goods slick is not easily distinguishable from the colour of water and any other things floating which influence the colour of seawater. In this case, a colour should be used whenever possible to mark the discharges.

It is necessary therefore that highly trained and experienced personnel be provided to do so, and helicopter be equipped with side looking air borne radar, infra red and ultraviolet line scanner, hyperspectral and multispectral trajectory and low light level television system for short range investigation and evaluation. Integrated navigation and recording equipment need to be part of the whole system.

Not less important is the command and control organisation which should be able to use the additional information collected by these methods.

4.1.3.2 Discharged Identification

Identification of the discharges of dangerous goods might be easier to do when it happens in a major scale or in maritime calamities, however, the case is very rare.

The dangerous goods discharges mostly occur in a small scale such as leaking drums, broken packages, or mishaps during the handling in ports. However, big scale accidents are possible to happen considering the density of sea traffic, violent weather, and so on. Collision between ships or capsizing might discharge packaged dangerous goods in a considerable amount. These packages are not easy to locate if
they have density close to that of seawater, or being driven by current, wind. When a container carrying considerable amount of packaged dangerous goods which are very toxic to the environment, it will create certain problems.

The detection of the discharge can be even more difficult when it is not visible, such as toxic gas or colourless liquids although global measurement using pH level or specific measurements according to the discharges might be applied. The use of colour is suggested whenever possible to mark the discharge to make it visible and easier to follow of its movement.

In case of maritime calamities report is usually given to the appropriate authorities. Reference is made to Regulation 7-1 Part A Chapter VII SOLAS 74 and "General Principles for Ship Reporting Systems ans Ship Reporting Requirements, Including Guidelines for Reporting Incidents involving Dangerous Goods, Harmful Substances and/or Marine Pollutants" adopted by IMO resolution A.648(16)

When legal proceedings are to be undertaken against a suspected offending vessel, samples are promptly taken from the discharges and from cargo contents. Sampling should be officially witnessed and performed in triplicate. They should be labelled and stored in a refrigerated space.

It will require specific analysis on the samples to prove the identity of the spilled dangerous goods on board. This is important as well to help defining the most appropriate response and clean up technique.
4.2 Prevention

4.2.1 Background of Accident Risk

Some issues to be considered concerning maritime safety are:

- Many of ships carrying dangerous goods are already more than 15 years old.
- Shortage of qualified and experienced seafarers and the fact of the mixed language crews.
- Inadequate revenue generation by shipowners to man and maintain the vessels up to required standards and to renew/update the capacity in due course; severe competition in the world charter market with supply exceeding demands and non-traditional charterers and “one ship” operators being prepared to “fix” on rates which barely cover marginal operating costs. Consequently, investment to improve safety standard are postponed.
- Inadequate enforcement of the wide range of existing safety regulations agreed at international level despite the Government’s ratifications of IMO conventions.
- Traditional policy by most of flag states administration and Classification Societies becoming increasingly ineffective.
- Emergence of unilateral legislation, increasing the finance and administrative problems of established and responsible shipowners, and providing incentives for less responsible “one-ship” owners to take the advantage of less rigorous national authorities.
- In port side, the improper cargo handling, storage, monitoring system can be a reason;

For land site, in ports, the background of the accidents might be associated with:

- Non existence of reliable regulations
- The non existence of certain particular equipments for specific cargoes;
- Weak control and monitoring system; port may not have certain methods of monitoring or personnel / team to monitor
-uncertain line of authority and responsibility creating uncoordinated, overlapping of job, and create vacuum area which is not dealt with by any parties concerned
-unskilled labour due to the poor or non existence training or expensive qualified labour;
-improper shed for dangerous cargoes with no compartementation or individual drainage system.
-improper locations of warehouses, storage area
-improper storage of dangerous cargoes caused by the mixing of incompatible dangerous cargoes or too high stacking.
-non existence of clear sanctions with no clear punishment for the violation of rules.
-poor maintenance of emergency response equipment
-uncentralised area or berths for dangerous cargoes which might cause difficulties in controlling.
-improper use of equipment and facilities for cargo handling by lack of training or ignorance.

4.2.2 The Approach of the Industry

Unlike oil industry, for dangerous goods industry there has not yet any attempt to deal with the pollution and compensation relating to dangerous goods discharges. In IMO this is being worked out together with the intended expansion of the OPRC Convention to cover dangerous goods. Altough in some countries industries are involved in contingency planning establishment, such as In the United States of America, Canada, and several other countries, an international regime has just newly adopted HNS Convention in May 1996 in view of the global approach to the management of dangerous goods material.

If HNS Convention is in force, governments parties to the convention can set up the cooperation regarding the finance consequence arising from dangerous substances
response operations. This will stimulate chemicals producers or transporter to cooperate also in the manner similar that has been done by oil producer and transporter.

Nationally government will have also to regulates the finance responsibilities of the industry and transporters of dangerous chemicals. This way will open the road to the setting up of emergency response for dangerous cargoes accidents on the part of government and industries.

4.2.3 Governmental Actions

With respect to the accident risk in maritime transport, Government should act nationally and internationally.

Internationally Government should ratify international conventions pertaining to dangerous goods safe handling and transport by sea. This will include the OPRC and HNS conventions. Besides Government has to take considerations of IMO recommendations pertaining to the matters. One of them is the recommendations of the safe handling of dangerous goods in ports and manual on contingency planning.

Nationally Government should ensure the enforcement of the given conventions by providing an adequate conditions and incorporate the provisions of the convention in the national law.

If this is so, the elimination of sub-standard ships is enforced and this will help to increase the necessary freight rate so that shipowner may begin invest for safety, and consequently leading to safer shipping and cleaner oceans.

The following points are the details of what government actions should be:
- improve the accountability of the flag state administration for performing their responsibility to the IMO
- tighten the links between shipownership and country of registry and curtail the freedom of shipowner to “shop around” between registries
- tighten the ILO/IMO manning, training, and certification regulations. The IMO has recognized that incompetence, fatigue and communication problems between multilingual crews probably cause more accidents than poor design and maintenance. Only Government can prescribe and enforce such higher standard.
- increase the finance resources of Government agencies to enable recruitment and training of sufficient staffs already familiar with modern specialized shipping, thereby facilitating compliance with Flag and Port State responsibilities.
- improve control of Flag State responsibilities delegated to classification societies (IACS)
- concentrate port state inspections on high risk features such as elderly vessels, Flags with poor records, non-IACS members
- extend the frequency of Port State inspections, implementing more vigorously the IMO’s recent extension of Port State inspections to cover manning, training and operational procedures
- extend the scope of inspections beyond simply vetting ship’s certificates
- strengthen the sanctions on deficient vessels, more than just a warning
- extend the coordination of Port State inspections from a national to global basis
- publicize vessels inspections deficiencies and enquiries into vessel casualties

4.2.4 Global view on Maritime Accidents

Lloyd’s Register of Shipping shows that frequency of maritime accident does not increase, in average 0.5% of the vessel’s fleet lost per year due to accidents worldwide. However in view of the increasing vessels size the possible magnitude and impact of the incident may increase. The lost of vessels and the causes of the acci-
Navigational errors, i.e., grounding and collision are caused 80% by human error. This means that human factors need to be paid attention more carefully. Improving education of adequate numbers of navigation officers according to standard requirements laid down in STCW Convention should be done properly. Vessel traffic separation system is one way to improve the situation, while the computerized anti-collision radar is also possible to be utilized in this matter.

In fact, frequencies of grounding and fires increase with the age of vessels. Fire fighting systems and equipment on board the ship is to be adequately prepared on such ships.

The data does not mention however how much of the accidents have something to do with dangerous goods.

Some examples of accidents involving dangerous goods can be seen in the following table.

<table>
<thead>
<tr>
<th>Accident Causes</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather conditions</td>
<td>37%</td>
</tr>
<tr>
<td>Grounding</td>
<td>35%</td>
</tr>
<tr>
<td>Collision</td>
<td>12%</td>
</tr>
<tr>
<td>Fires</td>
<td>16%</td>
</tr>
</tbody>
</table>
Table 5: Examples of Dangerous Goods Accidents

<table>
<thead>
<tr>
<th>Name of Vessel</th>
<th>Port/nearby Port of Accident</th>
<th>Dangerous Goods Involved</th>
<th>Loss/Injuries</th>
<th>Year of Accident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Stikene</td>
<td>Port of Bombay</td>
<td>-1,400 tons explosive</td>
<td>-15 ships</td>
<td>1944</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-cotton</td>
<td>-1,250 lives</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-oil</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-dropped cigarette</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-ammonium nitrate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-empty gas cylinders</td>
<td>-21 lives</td>
<td>1947</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-various</td>
<td>-3 lives</td>
<td>1980</td>
</tr>
<tr>
<td></td>
<td>Port Kelang</td>
<td></td>
<td>-US $12 million</td>
<td></td>
</tr>
<tr>
<td></td>
<td>North west coast of Spain</td>
<td></td>
<td>-23 lost</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-15,000</td>
<td>1987</td>
</tr>
</tbody>
</table>

(Source: IMO/UNEP Consultation Version -APELL for Port Areas, 1996:1-3)

From each of the above accidents some lessons learned are also pointed out by the same source. The important issues to be noticed are that international attention, in this case IMO has addressed the matters seriously and put in their recommendations things which should be corrected such as the methods of fighting fire caused by ammonium nitrate, segregation provision, the need to have plans for oil and chemical response, and port authorities needs to assess routine operation and practices.

### 4.3 Response

When dangerous goods discharge occurs, it may occurs in small or medium, or even large scale. A response to such an accident is to be given with appropriate clean-up action to avoid damage to the environment. The response approach will usually started with verification of the reports, determination of the techniques of response, cleaning, and disposal of the discharge.
4.3.1 Verification of Pollution Reports

Reports on the discharge of dangerous goods should be assessed for its probable magnitude and likely impact of the discharge. A solid and adequate information is the most important thing in this case, which might possibly be gained from the first line reporter.

The authority should collect all relevant information through the first line reporters and its organizational unit. A standardized dangerous goods discharge report is to be developed and used in all the reporting stations. This standardized reporting form constitutes the basis for the further actions.

The following items should be given in the report:

- date and time of observation (in local time or GMT)
- position (latitude, longitude or stretch of the coast)
- source and cause of pollution (name and type of vessel, collision or grounding, etc.)
- amount of the dangerous goods discharges and possibility of further spillage
- description of the discharge including direction, size, appearance, etc.
- type of the discharge
- action which has been or intended to take to combat the incidents and preventing further discharge
- name and address of the first observer and reporter and the methods to get in touch with them

Based on the collected information, it will be determined by the authority whether the furtherance of investigation is necessary and whether certain expert is needed to make an evaluation of the report. Local authority may decide to verify the report by directing one or more vessels of the port organisation to the area.
Reference is made to ship reporting systems and requirements including incidents involving dangerous goods, harmful substances or marine pollutants published by IMO "Provision Concerning the Reporting of Incidents Involving Harmful Substances under MARPOL 73/78 "(Resolution A648/16;IMO publication 516-E).

4.3.2 Response Techniques to Discharges

Various techniques and equipment may be applied for the containment, collecting and cleaning of dangerous goods discharges depending on the result of risk assessment.

The following table depicts types of behaviour and principal response method for dangerous goods discharges.

Table 6: Behaviour of Substances and Response Methods

<table>
<thead>
<tr>
<th>BEHAVIOUR</th>
<th>RESPONSE METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floating discharges</td>
<td>Pumping, containing, skimming, dispersing, sorbing, gelling.</td>
</tr>
<tr>
<td>Evaporating discharge</td>
<td>Water sprays, chemical foam, combustion</td>
</tr>
<tr>
<td>Dissolving discharge</td>
<td>Neutralization and chelation, reduction, sinking sorbents and precipitation</td>
</tr>
<tr>
<td>Sinking discharge</td>
<td>Dredging, neutralisation</td>
</tr>
</tbody>
</table>

(Source : Cedre, 1989)
4.3.2.1 Treating Floating Discharges

Some response techniques applied to oil spills might be justifiable to be used to treat floating dangerous good discharges with near or similar oil behaviour. Such type of discharges usually ones that dissolve only slightly and do not evaporate too quickly.

Applying sorbents, gelling agents, and solidifiers, are considerable for the objectives of facilitating the recovery of a pollutant or of treating the pollutants for security reasons on reducing flammability or toxic vapours. While dispersant use may speed up the environment to eliminate the pollutant by itself.

The principle of using floating sorbents is to use a more or less porous solid (the sorbent) to attract and hold a contaminant. This can be achieved in three ways, i.e., by adsorption and/or absorption and/or physical trapping.

By this way the contaminant is easier to recover than when it is liquid, and the contaminant’s dissemination, its spreading tendency over the surface and tendency to dissolve or evaporate will greatly be reduced and slowed down.

Choice of sorbent products to be used depends on the locations and chemicals to be applied to, and the scale of the discharge.

On land, sorbents from saw dust, cotton rags or straw are cheap and easy to get. While in the water, the use of oleophilic and water repellant product are used to avoid the fixation and subsequent recovery of the water.

On applying sorbents to a chemical a careful consideration is necessary to make sure if the sorbents will not be dissolved when in contact with the chemicals.
Chemical compatibility relating to the use of sorbents have been tested and listed by Environment Canada in 1986. This will be reproduced in Annex 2.

Two types of sorbent products are manufactured. Bulk sorbent can be originated from pure or treated industrial waste or synthetics products. There are three kinds of bulk sorbent regarding to the materials they comes from, i.e:
- treated minerals : expanded perlite, vermiculite,
- treated or untreated plant products : saw dust, wood shavings, peat,
- polymers : polyurethane, polypropylene, polystirene, epoxy.

Sorbents belong to another types are those produced in the form of packaged booms, pilows, and absorbant sheets. They are applicable to a small scale of discharges as to complete cleaning after the recovery of contaminant by other means.

Technically the second type is easier to use but it is more expensive than the previous one.

Laboratory experiment shows that sorbents are able to fix the volume of pollutant between 0.6 to 1. Field experiments however require double amount of sorbents to trap the same quantity of pollutant.

According to the result of tests for both types of sorbents , sorption possibilities performed is greatly influenced by the solubility of the chemicals. Sorbents will not effective for very soluble chemicals.

The important things related to the practical application of sorbents are among other things the solubility and vapour tension of the discharged chemical in the water as to see if the discharge stay long enough on the water surface to allow sorbent to be applied maximally.
The nature characteristics of most potent contaminants/pollutants are light, very low in viscosity, often able to evaporate or dissolve makes it difficult for the application of the absorbents in open water. It is therefore preferable if it is applied in an enclosed water body in port area where discharge is confined.

Technic and logistics problems present in the application of absorbent when they are used in big amount. This is the case when the purpose is to make complete recovery of pollutant in big scale of discharge so that it requires double quantity of sorbents used in normal recovery. Obtaining, transporting, spreading, and recovering, treating are the typical problems.

The most effective use of the sorbents is when they are directly applied to the pollutants. In a very small scale use of of hands might be sufficient, In larger or big scales involving immense surface to be covered other techniques should be introduced.

Water spray and air spray techniques are applicable to spread the bulk sorbents over large surface of coverage. The use of water spray techniques will enable the spraying over longer distance and more withstanding from windblows, however the rate of sorption capacity is reduced by the contact of the water in the device.

Air spray techniques does not decrease sorption capability of the sorbents, however the reaching distance of the sorbent sprayed in this way is shorter (5-12 metres) and sorbents will be easily blown downwind direction.

Besides using sorbents, there are some other methods which have been developed to treat the floating discharge of dangerous goods.
Gelling agents or solidifiers may usually be applied to minimise the dissemination of pollutants by reducing their spreading, dissolving, and evaporation capabilities. These agents may take the forms of powdered or liquids.

They work by increasing the viscosity of the pollutant so as to enable its recovery. The product can be seen from the creation of solid network within a film of pollutant in one of the following ways:
- reaction of two pure reagents or two reagents in a solvant,
- spreading one agent in solution in a solvent which is then evaporated or which partially dissolved in water,
- spreading a compound which dissolves in the pollutant and forms a solid network when dissolved.

Formulas adapted to the treatment of floating chemicals are:

- A good diffusion of reagent(s) within the pollutant to achieve a homogenous solid network providing no problems in affinities between the components. Low viscosity will improve this work.
- Requirement of non-incompatibility of pollutant which may halt the treatment product’s actions.
- The water solubility of treatment product should be nil or considerably nil to prevent the loss of products.

Two important gelling agents or solidifiers (RIGIDOIL and NORSOREX) have been produced and tested and the use of them is advisable for floating discharges in port areas or in sheltered zones although doses of application should greatly exceed the amount recommended by manufacturers. Important issues to be noticed are proper choice of effective couple of reagent/chemical contaminant, and the best methods for applying them.
Another method of treating the floating dangerous goods discharges is the use of dispersants. Different from the previous methods, dispersant works by promoting the dissemination power of contaminants/pollutants in the water columns so that slicks will be prevented from reaching the shoreline or coast because of wind's behaviour. This will also speed up the natural degradation of pollutants.

Contradictory opinions on the use of dispersant exist because of:
- increasing of the spreading toxic resulted from the rapid dissemination of pollutants which will increase the local immediate toxic effects of the pollutant when in contact with the living things, and;
- missing of scientific supports on the ability of dispersant to speed up natural degradation of chemicals.
- missing of scientific supports on its suitable application on chemical more dangerous than oil.

The use of dispersants however is reasonable under some circumstances, particularly for the sake of safety such as those floating discharges spilled over near the port area or population housing, which gives off very toxic or flammable vapour and so on which could endanger them in the considerable extent.

Experiment with the use of dispersant on several chemicals reveals that floating substance with solubility greater than 0.3% can disperse by itself. Other factors which must be taken into account when deciding the effectiveness of dispersant application is the density, viscosity, chemical attraction and hydrophilic lipophilic balance (HLB) values.

Other difficulties in using dispersant is due to the colourless of chemical slicks to be dealt with that it is difficult to control because of the invisibility of the slick or dispersed cloud in the water column.
4.3.2.2 Treating the Evaporating Discharge

What are considered as chemicals which evaporates in the context of sea transport refers to liquifred or compressed gas carried in bulk, and volatile liquids of boiling point lower than 250°C.

As usual, any response is to be based on risk analysis. Evaporating chemical however has unique characteristics in its behaviour in that it deals with vapour cloud and its sources, so attention is to be paid primarily to the danger of such cloud. Cloud produced by volatile liquids or liquified gas may be toxic, flammable/explosive, corrosive, or reactive and so on.

The cloud will move and expand according to its relative weight to air, direction of wind, duration, amount, and speed rate of evaporation. The area covered and reached by this cloud is considered danger zone.

Consequently the danger area nearest to the sources of the cloud is the mostly or highest impacted by the danger. Depending on the amount and degree of dangers generated by clouds, it can be regarded as high risk or slight risk.

In high risk situation the impacted area may need to be abandoned or evacuated by the people and activities in the area may be stopped until the danger is gone. Evacuation at sea may be done by helicopters, or other ships.

On land evacuation in port, its surrounding and other affected area are done according to the advanced planning prepared beforehand in a contingency plan in which the already designated areas are defined and methods of evacuation have been worked out.
In case of slight risk, on board ship people are to stay inside cabins or rooms with closed windows and other opening. All electricity should be stopped. And access to the hazardous maritime area should be restricted.

After securing the area effeted by the clouds/vapours, If intervention is considered possible to responding at the source of discharge, team are to be well protected with reliable and proper suit and provided with the portable devices enabling the demarcation of danger zone.

Possible actions at the sources of discharge are to stop release, to release totally the chemical, to transfer the cargo on board to other ship(s), and to tow the damaged vessel away from the coast and eventually to sink the vessel.

To stop the release means to close the openings of the leakage or discharged by closing the openings such as valves.

To release all the chemicals involved by enlarging opening to force the entire chemical to come out for burning. This can be done in the condition that other attempts are proved non-effective and the product of the combustion may gives off some hazard.

To transfer the cargo from the damaged vessel at quay or by means of lightening is another choice when it is possible to do. The utilization shipboard equipment available from either vessels can be used as far as they are compatible in terms of the chemicals being transferred.

Another way is towing the vessel away from the coast and is sinking it.
Besides the previous two response actions, ie the action given to the danger area/zone and action at the source of discharge, responding the already discharged chemicals should also be done.

In this respect, the attacking methods may be to apply combustion, water sprays, and chemical foam.

Combustion is used when the response is rapid, and risk of combustion can be considered nil.

Water sprays is applied on very heavy toxic gases or on water soluble gases. It will pushes back vapours of volatile chemical and give the effects of cooling down containers exposed to heat. By this way it will decrease chemical’s concentration in air and cool down the area surrounding the fire. Fire hoses or specific spray system can be used to produce water spray.

Foam is a frothy mass of bubles which have captured air or other gases. The bubbles are made of a chemical and often surfactants are formed in a foam’s chemical formula. It is applicable to pollutants with apolar compounds (e.g.: aliphatic hydrocarbons) and polar compounds (e.g.: alcohol, keton, aldehydes, esters, ethers, amines or amides).

In order to use foam efectively and properly, attention to be given on the choice of foams, application system of foam, and environmental conditions. Each types of chemical needs an appropriate kind of foam. Very frothy foams will be effected by winds. A system for confining system is necessary if winds is more than 4.5 m/s.

Due to the environmental factors it is difficult to apply foam on high seas. the utilisation of foams is recommended and very applicable in port area or enclosed
water zone. Every high risk area, including storage areas, loading docks, and other parts of port area needs to have appropriate emulsifier’s in place.

Foams can also be applied on chemicals which are reactive to water (e.g., sulfur trioxide, ammonia, silica tetrachloride) in order to form a reaction product which is less hazardous than the original chemicals.

4.3.2.3 Treating Dissolving Discharge

The rapidity of dissolving into the water columns and the invisibility of dissolver chemicals are two most important factors which influence the effective treatment responses for such a discharge.

The fact that ocean can absorb acids or bases with no noticeable pH change, that sea water is ionic and, that thermocline and currents will influence horizontal and vertical diffusion of soluble chemicals, are the environmental factors to consider when treating the dissolver chemical.

Considering those factors, any response to the dissolving discharge has to be rapid, adapted to each type of chemicals, and benefit to the environment. Rapidity of response is of prime importance since often after several hours, treatment is no more possible.

Methods of treatment usually applied in response to the dissolver discharge are neutralization, precipitation and chelation, and oxidation and reduction.

Changes in pH of water by considerable amount of base or acid discharges can give either lethal or sub lethal effects to the marine organism, and increasing toxicity of heavy metals by enabling them to become soluble.
First method is neutralisation. Neutralization of the above situation can be done by applying environmentally harmless neutralizing agents. Sodium dihydrogen phosphate is commonly used for the neutralization of base, while sodium bicarbonate is well known for the neutralization of acids.

The advantages of using them are that they do not harm personnel or environment, are inexpensive, and are easy to store without any specific precautions.

The disadvantages are of logistics and technics. The large amount is needed (ratio 1:3.5) between pollutant and neutralising agent in order to gain 100% neutralisation.

For the application, measurement of pH in the location is needed. Using phosphate neutralizing agent may result in eutrophications of the environment and increase primary productivity.

Second method to deal with dissolvers is precipitation and chelation. Precipitation is the formation of a new insoluble compound as a result of the reactions of two soluble chemicals. The resulted particles will coagulate and form aggregates which precipitate in the water column. A co-precipitation may also occurs with the Natrium Chloride salt in the seawater.

The precipitation is very useful to eliminate the toxicity of soluble heavy metals to the aquatic organism.

Types of precipitants known are of organic and inorganic. Inorganic precipitants include among other things chalk (calcium carbonate), sodium carbonate(Na2CO3), ferric chloride(FeCl3), alum(aluminium sulfate) and sodium sulfide. Examples of organic precipitants are dimethylglyoxime (= N - OH group), Cup ferron (
ammonium salt of phenyl nitrosodroxylamine), and 8-Hydroxyquinoline (benzopyridine) or oxine.

Problems arise with the precipitation are among other things the possibility of a precipitate redissolving again, maximum effectiveness is greatly influence by pH of water, its work is often inhibited by the presence of certain ions in the seawater.

Precipitant used is on the order of 1 to 1 (one kilo of precipitant for one kilo of dissolver)

Chelation is complexation between a chemical and soluble organic ligand which may be referred to as a "sequestrant". This will de-activate a metal ion to become non toxic.

Sequestrant agents EDTA (Ethylene diamine tetraacetic acid) and NTA (nitrilo triacetic acid) contain negatively charged group and are used with positively charged metals such as manganese, iron, cobalt, nickel, copper, and zinc).

one of the problems of the sequestrant agents application is the interference of seawater ions (Ca, Mg, and Na) when they also complexed with the agents.

Third method to discuss in the treatment of dissolving dangerous goods discharge is oxidation and reduction. This method works by oxidizing or reducing chemicals to form intermediate compounds with less toxicity than the original chemical.

However this method is difficult to apply at sea conditions.
Other methods are using clays of smectite type and applying activated carbon and ion exchange.
Smectite clay acts as sinking sorbents and catalysts as it absorbs some metals and organic chemicals, and catalyzes the degradation of phenols and dioxine. This method is simple, inexpensive, and non-toxic risks. This can be applied in the developing countries.

Activated carbon and ion exchange is applied only to treat polluted water when spill has been confined. This is done to eliminate organic and some organic chemicals.

4.3.2.4 Treating Sinking Discharge

Basically the response methods applied to treat the sinking discharge are recovery and burial, which is done by dredging and burying. Many techniques of dredging are applicable depending on the nature of the sinkers and location affected.

Confinement for the sinker pollutant or its neutralization might be done if possible and necessary.

Priority of recovery should be given when pollutant affected the area where there are many life forms affected and when chemicals is persistent, bioaccumulable entering cycle of food chain.

The first step is localizing the chemical. This can be done in several ways. The most common one is by global measurement of the pH level or the specific measurements for the spilled chemicals. Another thing is sampling of water and sediment by laboratory analysis and also observation direct to the spot by for example videofilming technique.
The next step is to do recovery action when possible. Recovery actions need a precise determination of the limits of pollution on the bottom sediment, the use of protective measures for the personnel who handle hazardous chemicals, prediction of harm for the aquatic and benthic environment, the provision of transportation, intermediate storage, treatment and waste recycling.

Important points to be taken into consideration when deciding to use dredger pertaining to the recovery of the most pollutant with minimum serious environmental impacts are:

- precise determination of the limits of a polluted zone to be dredged
- precise control over the lateral and vertical movements of the dredging head
- a clear understanding of the toxicity of the dredged chemicals
- provision of the change of transportation, discharge and treatment of wastes.

Systems of classifying dredging methods has been developed by the U.S. Coast Guard as the followings.

- Based on the means used for moving material: Mechanical or hydraulic dredges
- Based on the means of storage and treatment for the sediment: Pipelines, side castor, hopper
- Based on the devices uses for excavating sediment: cutterhead, mud dredger
- Based on the pumping devices used: centrifugal, pneumatic, airlift.

On the consideration of the classifications, 4 main types of dredging devices are identified, i.e.: mechanical, hydraulic, pneumatic and special purpose devices. Appendix 12 describes the various methods of dredging and their comparative advantages.
As can be seen in table in order to use the dredger to be applied qualified personnels involving the laboratory people, response coordinator, as well as dredger operator are needed.

Burial of the contaminants can be initiate as a temporary or permanent one. The principal of burial applications are to eliminate an accidental spill after most of the pollutant has been recovered and in the event chemical present no more danger.

However the application should also be justified in case burial is the only alternative because recovery is too risky, such as the cases with aluminium floride, calcium floride, lime and arseniate for moderate toxic. The same principle applies with very toxic materials such as red and white phosphorous, and explosive, for examples 2.4 dinitroaniline and 2.4 dinitrophenol.

4.3.3 Cleaning of the Polluted Water

Cleaning of the polluted water might be necessary if the material resulted from response operations affected the shoreline which creates dirty and unpleasant look, smell and so on.

Depending on actual situation, the extent of the necessary clean-up may be determined. Sometimes it is not worth doing to execute a clean up if the nature can adequately overcomes by for example biodegrading actions.

Approach to be chosen depends much on the type of shoreline and the spots of environmentally sensitive areas.
For example the cleaning for sandy beaches, estuaries, deltas, fishery harbours, industry ports and coastal installation needs different approach.

Some other considerations are the analysis of the degree and type of pollution, length of affected coastline, accessibility of waterfront.

Clean up may be arranged into different stages from the big, medium and small. The effectiveness of the clean up operations will need proper organization of the designated people working in a team. Clear command and communications and methods of approach of cleaning stages should be establish. Dirty and clean areas are to be segregated properly. Traffic environment should be controlled for smooth operations.

Record and reportation for day to day operations should be prepared and done adequately which might be useful for the formulation of compensation claim. Monitoring progress of clean up is very important to now the amount of the clean up done, status of work sites, location of the workforce and equipment mapping.

If contractors are involved, they are to be chosen properly of their abilities in providing the needs of the clean up operations. This should be pre arranged and identified beforehand in a contingency plan.

4.3.4 Disposal of Chemical spills

When clean up operation generated the collection of considerable waste, the problems might be related to the disposal or treatment. In case the waste can be recycled it will be the best choice.
The options for disposal will have to consider the amount and type of waste, content of chemicals, technical options available, environmental and legal considerations, and cost involved.

Transporting and storage of the waste may also present some difficulties. Intermediate storage is important to be provided while allowing the time to determine the best methods of disposal.

Waste treatment of the industry might be a choice to hire or else other methods are applied such as landfill dumping or combustion methods.
5.1 Shipping and Dangerous Goods Products

5.1.1 Current Development of Surabaya Port

5.1.1.1 Responsibility and Management

To give a clear picture of the responsibility and management of the port of Surabaya, it needs to give overview of general port management and responsibility. This is to give an understanding of the existing different conditions in relation to the ports' capabilities for carrying out port environmental and safety management.

Ministry of Communications (MOC) is responsible for air, land, sea, and inland waterways transportations. At province level, MOC is represented by Regional Office of MOC (Kanwilhub). There are 27 Kanwilhubs, one for each of the total 27 provinces in Indonesia.

At national level the responsibility for Indonesian ports is delegated to the Directorate General of Sea Communications (DGSC), which actually the Indonesian national maritime administration.

The DGSC's main duties are to formulate technical policies and to provide technical supervision of the implementation of the programmes in sea communications sector.
To execute its responsibilities, DGSC discharges its jobs into a secretariate and six directorates. The secretariate deals with systems, procedures, international relations and legal affairs.

The important directorates to deal with ports' safety and environmental management are Directorate of Shipping and Maritime Safety, Directorate of Ports and Dredging, and Directorate of Sea and Coast Guard.

Directorate of Shipping and Maritime Safety concerns with among other things certification, design regulations, registration, protection of the marine environment. It issues the instruction to harbour masters on renewal of ships certificates and develop protection of sea and beaches, set regulations for ships, shipping, and seafarers. The responsibilities of the directorate includes the issues of reception facilities and dangerous goods management in ports and at sea.

Directorate of Port and Dredging gives guidance to development and equipments of ports, ports' services, dredging activities. It also guides the management of land and water use, sets service fee, and carries out dredging activities.

Directorate of Sea and Coast Guard is in charge of matters on emergency, pollution responses, rescue operation at sea, security in ports' land and sea areas.

*Various Bodies Involved in Ports*

In general Indonesian ports are basically divided into "Public Ports", "Ferry Terminals" and "Specific Ports".
Ferry terminals are under responsibility of Directorate General of Land Transport and Inland Waterways. The directorate constructs and fully manage the terminals. There are 83 ferry terminals.

Specific ports or specific berths are ports or berths dedicated for specific products of agricultural, forestry, mining, industry, such as oil, fertilizer, flour, timber, coal, and others. Some of them are used for the purpose of tourism. They are mostly constructed, owned and operated by private companies under permission of Minister of Communications. These kinds of ports or berths are not use for public without any permission from the authority.

To control such ports or berths, Ministry of Communications posts its personnel to perform its functions. In case of big ports, the ports operator is required to provide an office for the MOC personnel on duty.

Further, Public Ports is classified into 2 types. The first type is commerce ports and the second is non-commerce port. As the name implies, commerce ports are those which have orientation toward profit making, while the non commerce ports are non-profit oriented.

Commerce public ports are run by Indonesian Port Corporations (PT Pelindo) I to IV for its commerce operation activities. Pelindos are entitled to keep retained earnings for port investments and to involve private sectors in ports operations and development. The governmental functions for these kinds of ports are under the control of Port Administration Offices (Kantor Adpels)

Non commerce public ports are run by Port Offices (Kakanpels) for its “commerce operation activities” and governmental functions. So such ports are pure Government ports.
Both commerce and non-commerce ports are grouped into classes according to the volume and load of work they are assigned to carry out. Commerce ports are of classes I to V. While non-commerce ports are of classes III, IV, and V. Smaller class number refers to more workload, thus representing higher class.

Parallel to those classifications, Kantor Adpels and Kanpels are divided into several categories too. There are Kantor Adpels class I to V and Kanpels class III to V.

Respectively, Kantor Adpels class I are designed for commerce ports class I, and so forth.

In the area where there is a commercial port, but there is not yet any Kantor Adpel, Kanpel will assume the functions of Kantor Adpel.

Kantor Adpels class I have direct responsibility to the DGSC, whereas Adpels class II to V and all Kanpels are under the individual Kanwilhub according to the territorial jurisdiction where they are located.

The brief descriptions of a Port administrator Office scopes of duties according to the Decree of the Minister of Communications No. 89 year 1985 are:
- operational planning of port services together with other government organizations
- assessment of port, ship safety, size and registration of ships, and maritime services
- marking of beaches and shipping lanes, electronics, telecommunications, regulations of use and maintenance of ships registered under Indonesian national maritime administration
- security and order in the working area of the port, surrounding sea and beaches, and search and rescue (SAR)
The following figure 5 describes the organisation structure of Port Administration Office of Surabaya. This is formalised to all Port Administration Office class I.

For lower classes Port Administration Offices or Port Offices, the organisation is simpler, and will not be discussed here.

Figure 5: Organisation Structure of Port Administration Office Class I

It can be seen from this organisational structure that emergency and oil spill response is the responsibility of Port Administrator. In this case it is carried out by the directorate of Coast Guard Division.

There are four ports class I, which are located in different areas. They are usually called major or main ports, and regarded as gateway ports. All ports class I are in fact belong to commerce ports. These ports together with 106 other lower classes commerce ports are run by the 4 PT Pelindos.
Each Pelindo operates a number of ports located under a designated area. Figure 6 shows the areas of responsibility of individual Pelindo and the gateway ports' locations. Each PT Pelindo has as many branches as the numbers of ports they operate. Its head office is placed in the location of port class I, and its branch offices are situated at every ports it operates.

Figure 6: Distribution of Areas of Ports locations under Responsibility of Pelindos

(Source: DGSC, 1994)

This division of the areas of responsibilities might give an insight of the regional cooperations among those ports to have a standard or guidelines for the management of safety and pollution prevention and emergency response in case medium or big scale accident happens.
From the previous discussion, legal bodies responsible for the management of safety and environment in port can be described in following figures.

**Figure 7: Various Bodies Involved in Port Class I**

<table>
<thead>
<tr>
<th>Port Administration</th>
<th>Port Enterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National Level</strong></td>
<td>DGSC (MOC)</td>
</tr>
<tr>
<td><strong>Local Level</strong></td>
<td>Public Port</td>
</tr>
<tr>
<td></td>
<td>Kantor Adpel</td>
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<tr>
<td></td>
<td>PT Pelindo Branch</td>
</tr>
<tr>
<td><strong>Specific Port</strong></td>
<td>Harbour Master</td>
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<td>Private/State enterprise</td>
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**Fig 8: Various Bodies Involved in Commerce Port Class II - V**

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</tr>
<tr>
<td><strong>Regional Level</strong></td>
<td>Kanwilhub</td>
</tr>
<tr>
<td></td>
<td>PT Pelindo</td>
</tr>
<tr>
<td><strong>Local Level</strong></td>
<td>Public Port</td>
</tr>
<tr>
<td></td>
<td>Kantor Adpel</td>
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<td>PT Pelindo Branch</td>
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<tr>
<td><strong>Specific Port</strong></td>
<td>Harbour Master</td>
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<td>State or Private Enterprise</td>
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### Figure 9: Various Bodies Involved in Smaller Ports

<table>
<thead>
<tr>
<th>National Level</th>
<th>Port Administration</th>
<th>Port Enterprise</th>
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</tr>
<tr>
<td>Local Level</td>
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<td>PT Pelindo Branch</td>
</tr>
<tr>
<td>Specific Port</td>
<td>Harbour Master</td>
<td>State or Private Enterprise</td>
</tr>
</tbody>
</table>

(Sources: DGSC 1994)

As it is seen in figure 6, Port of Tanjung Perak Surabaya is under the management of Pelindo III.

The organisational structure of Port of Tanjung Perak Surabaya is depicted below.
The overall maritime organisation in the Port of Surabaya can be put in the following figure 11.
Figure 1: Maritime Organisation in Port of Surabaya

Legend:

- Direct control
- Partial control in execution of duties
- Co-ordination/Liaison

From the previous discussion we can see that the responsibilities in port of Surabaya are devided mainly into two organisations, namely the port of Surabaya itself as a
free independent legal entity enterprise, and the Port Administration Office Surabaya as the governmental body in charge of controlling the port.

Port Administration Office has nothing to do with finance interests of commerce port operations. Thus the main concerns to be dealt with by the organization are safety, pollution and security.

However port administration office has a role in labour supply system (see figure 4). Stevedoring companies are not permitted to employ their own labours. Port labours are registered, organised, and distributed by port administrator through Port Cooperation Labour Organisation upon requests of cargo handling or stevedoring companies

This way is done in order to prevent inefficient cargo handling and unreasonable dismissal of port labours by stevedoring company.

Relating to safety management, the existence labour system supply can be regarded as an opportunity for the Port Administration Office to create qualified and reliable workforce for handling of dangerous cargo.

The workforce should be prepared also as a part of assets to emergency response system. Training can be done through the Port Labour Cooperation Organisation. To do it will require Port Administration Office to develop policy, regulations and a system of enforcement on this matter.
Coast Guard Division and Coast Guard Fleet

Dealing with the emergency response and rescue in port of Surabaya, there are two legal bodies involved, ie Port Administration Office and Surabaya based- Coast Guard Fleet.

As can be seen from the organisational structure of Port Administration class I, it has a Coast Guard division. This division is in charge of port area security, emergency response and rescue, and oil spill combatting in port area.

Another body which is called “Surabaya based-Coast Guard fleet” is a separate body, independent from the Port Administration Office. Instead it works directly under the Sea and Coast Guard Directorate. This directorate is a part of the Directorate General of Sea Communications.

There are 5 bases of Coast Guard Fleet throughout Indonesian waters. One of them is in Surabaya. The duty of these fleets is to deal with rescue and pollution combatting outside port water area. They operate bigger rescue and patrol ships with can be used to cover all Indonesian waters. There are 9 class II ships (see table 17) and for the ship under their responsibility. These fleets are available for 24 hours a day and ready any time to help rescue and pollution combat in all Indonesian water under the request of Port Administrators.

Appendix 2 shows the designation of Coast Guard Fleets bases

5.1.1.2 The Handling of Dangerous Goods in Port of Surabaya

Legal aspects
At present the existing legislation at national level for handling of dangerous cargoes by sea, road or rail are described in:

- Oil transport Ordinance/ Regulation 1927
- Shipping ordinance 1935 (article 143 to 153)
- Presidential Decree No. 60-1986 on the ratification of SOLAS 1974
- Shipping Act No. 21/1992

The oil transport ordinance/regulation 1927 and Shipping Ordinance 1935 are practically "out of Fashion". Many things stated are not relevant, particularly regarding the changes of the organisations and legal bodies involved in the transportation. This creates problems of the uncertain responsibilities when something goes wrong.

The proper implementation of SOLAS 74 is incorporated in Shipping Act No. 21/1992 however they have not yet readily implemented because to make it operational they should be translated into government regulations. Until the time this dissertation was written such Government regulations has not yet been formalised. They are still waiting to be nationally approved by Parliament.

Dangerous cargo handling in the port now is trying to adopt the IMDG Code. This has been done since 1979 in the form of two Joint Decrees of the Tanjung Perak Port Administrator, Tanjung Perak Harbour Master, and Head of Directorate of Customs Region VII Tanjung Perak. The Joint Decrees were issued on 1 February 1979.

The first Joint Decree was about The List of Dangerous Goods Specific for Port of Tanjung Perak Surabaya, containing the names of dangerous goods which are subjected to have specific permission for their handling in the port of Surabaya.
Names of dangerous goods listed were adopted from IMDG Code published by IMCO, the old name of IMO. Dangerous goods were classified into three groups.

- Group I referred to dangerous goods which have to be directly unloaded or temporarily stored in barges. This group includes radioactive and explosive materials.
- Group II consisted of dangerous goods which have to be directly unloaded or stored in dangerous goods warehouse, for example inflammable liquids.
- Group III composed of dangerous goods which can be stored in specific warehouse, for example toxic gas.

Other substances which are not included in the list will be treated with reference to IMDG Code issued by IMCO.

A specimen of this list is given in appendix 3.

The second Joint Decree is on the Procedure for Loading-Unloading, Storage, and Transporting of Dangerous Goods in Port of Tanjung Perak Surabaya. The procedure defined:

- the authorities, users and their respective responsibilities;
- the required facilities, i.e., specific warehouses, wharves, and barges;
- the required permits;
- loading and unloading activities, and;
- sanctions to violations.

Although there is a requirement for the provision of fire extinguishing equipments during the operations, the number and types of which are not defined. And yet no guidance as to how to proceed the emergency situation.

The reference on the provision of packaging, labelling, and segregation are not mentioned.
Also the sanctions are executed according to respective departments, and not yet uniformed. No Liability definition of the parties involved. The Shipping Act 1992 regulate the sanctions of the violation against the rules of dangerous cargo handling by giving penalty to the violator to among other thing compensate for the damage of port infrastructure and other facilities. It also regulates the procedure how to sue the violator. The violators can be the ports users or authorities involved in ports. The users can be port users or authorities in ports.

However it is not yet applicable since the Governmental regulations concerning the Act has not yet existed.

The only available regulation concerning the sanction of dangerous goods transport is the regulation Stb. 1938. This regulation absolutely has to be changed. because as stated in its Chapter I page 3 the maximum fine for the transporter of explosive without necessary permit from the authority is only Rp.100.

The available and enforced regulations are those related to the sanctions of sea transport in general are:
- Law No. 33/1964 on the passangerr accidents compulsory insurance fund;
- Government Regulation No.17/1965 on the realization of the passanger accident compulsory insurance fund;
- Presidential Decree No. 64 M/1988;

The compensation awarded to the victims or victims’ family of maritime accidents are:
- When victim dies........................................ Rp. 2000,000
- Maximum cost of Medical Doctor treatment..Rp. 1,000,000
There are about seven forms to be filled out by the users in the process of obtaining permit and other four forms for obtaining permit to do extra works after regular working hours. This will be put in appendix 4.

In the absence of national legislation, these Joint Decrees are still being used as a basic reference in the operation, despite of its out of date conditions.

Some attempts have been made later on, among other things is the circular of Director General of Sea Communications issued on 12 January 1990. It tries to describe the requirements on classification, documentation, labelling, storage, and segregation. In addition procedures of loading and unloading of dangerous goods, and fire prevention requirements are mentioned.

The latest attempt is the issuance of the Port Administrator circular issued on 26 April 1996 on “Handling of Explosives in Port of Surabaya” the latter two have been described earlier in the Chapter Three.

*Line of Authority*

Line of authority basically still follows the idea of provisions mentioned in the Joint Decree.

Port Administrator, represented by Harbour Master has the responsibility to ensure the safety on board ships. by doing proper control and inspection of cargo handling on board the ships. It is entitled to issue permit of such handling activities. Harbour master is to make sure that requirements are properly fulfilled throughout the whole operations on sea side.
The Port of Surabaya, is responsible to provide facilities and related services. It is to ensure safe operation of dangerous cargo handling and movement and storage is done properly by berths operator, stevedovers, shipping or transportation companies from the point the cargoes are in berths to the time when cargoes leaves the port.

This is done by planning, supervising port services, utilisation of berths and storage facilities.

All port users have the responsibility to do the handling, transporting, storage of the dangerous cargoes under the permit and supervisions of the harbour master for seaside safety, and port of Surabaya for landside safety.

**Implementation and Enforcement**

As it has been described previously that there is not adequate or reliable legislation in respect of dangerous cargo handling in port of Surabaya, and the practice of dayly operations are still use the old references. The references, that are the Joint Decrees create some difficulties to be implemented since many of the provisions are not anymore relevant to the present situation.

The implementation much depends on the port’ users themselves. The Port administrator in this case, according to the Joint Decree has responsibility to supervise the loading and unloading activities. Thus it much depended on the report from the users and Surabaya port in the further movement of the cargoes after unloading.

In case of the accidents there will be confusion as to whom the responsibility will be assumed.
Port Facilities

The following will describe the existing facilities for dangerous cargoes in Port of Surabaya.

a. Berths :

- Jamrud Utara (North Jamrud). Length 1,200 m. Water depth 9,2 m
- Jamrud Barat (West Jamrud). Length 170 m. Water depth 8,0 m
- Jamrud Selatan (South Jamrud). Length 800m. Water depth 8,0 m
- Perak. Length 140 m. Depth 7 m
- Berlian Timur. Length 760. Water Depth 9,0 m
- Berlian Barat. Length 600 m. Water Depth 9,5 m

- Berlian Utara. Length 140m. Water Depth 7,0 m
- Nilam Timur. Length 860 m. Water Depth 9,0 m
- Mirah. Length 640m. Depth 7,0m
- Intan. Length 110 m. Depth 4,0 m
- Kalimas. Length 2,390m. Water depth 2,0
- International Container Terminal. Lenght 500. Water depth 10,5

Practically all berths in the port of Surabaya are available for dangerous cargoes, except the passenger terminal in the eastern part of Jamrud Utara.

Nilam Timur is used for specific ship carrying bulk liquid and dry cargoes and bulk chemicals as well.
The non existence of specified berth for handling dangerous cargoes can create problems, because accident might happen everywhere, and it might affect area which should not be affected.

When dangerous goods are handled in centralised area then priority can be given to the safe operation in the given area. It means effective and efficient dangerous cargo management can be more easily done, including the emergency response planning and contingency plan.

This will create maximised utilisation of the existing resources so that the real shortcoming can be addressed to be given a feasible solutions.

b. Warehouses:

The locations of warehouses for storage of dangerous goods is at the outside part of the port, to the west of International Container Terminal. There are 3 warehouses dedicated for this purpose. They are Warehouses “A”, “B”, and “C”, each has the following specifications.

- Length : 60 metres
- Width : 25 metres
- Area : 1,500 square metres
- Load Capacity of Floor : 3 tons/meter

Every individual warehouse is equipped with fire extinguisher(CO2), Fire extinguisher for poisonous fire, sand, water, and empty bag.
According to the examination of the author, the location of the warehouse is already far from the population. It is far from the port's activity centre and in fact a little bit outside from the port.

They are built more or less according to criteria of dangerous goods shed; it is built with strong walls and relatively weak roofs, and strong steel doors. It has automatic water sprinkler on its roofs.

Despite of the above conformity to the rules, some weaknesses were found during the field research, they are:
- too far from the berths
- ventilation were not so good;
- automatic water sprinkler did not work
- some part of the roofs were leaking
- lighting were very poor
- no separate compartement
- no separate drainage system
- no specific emergency centre nearby
- no warning sign, such as "no smoking " remark, etc.
- no emergency plan
- not very clean

There is a small office in the vicinity run by two godown personnels, one is the godown master and the other is the staff. The staff has a specific training in chemistry.

Next to the office is a security post employed by two security personnels. Both will help in case accidents happen. They know how to use CO2 fire extinguisher agent
and frequently help in fighting small fire. However they are not trained or introduced to the way to deal with fire involving dangerous gooods.

c. Equipments

There is no specific equipments for handling of dangerous cargo other than fire extinguisher and fire vehicles.

Port Operations

The operations of dangerous cargoes in port of Surabaya is in accordance with the following procedures:

a. loading
- ship’s agent submits a request for loading of dangerous goods to the harbour master. The main documents to be submitted are manifest, loading form, and list of dangerous goods.
- harbour master appoints surveyor to make on the spot examination.
- based on careful judgement and the report of survey handed by surveyor, harbour master may give approval to issue permit for loading
- ship’s agent will receive the permit and distribute it to port of Surabaya and other concerned parties for the execution of loading operations.

b. unloading:
- the unloading obtainment is similar to those of loading with the exception that harbour master does not need to appoint surveyor to carry out on the spot examination.
Other kinds of permits besides loading/unloading permit may be needed to obtain relating to loading and unloading operations, they are:

- permit for using of port's facilities and related services from port of Surabaya;
- permit for stuffing and stripping of dangerous goods from customs;
- permit for truck losing and truck loading from sea traffic transport unit;
- permit for working over time in port from the Port Administrator, and;
- permit for assistance of port fire brigade from port of Surabaya.

A specimen of a permit will be given in appendix 4.

In case of loading/discharging radioactive or explosives, specific permit from Port Administrator and Police have to be obtained.

**Monitoring**

The procedures of obtaining permits reflects the monitoring system. There are multiple checks and approvals by authorities. In the real operations monitoring is done by harbour master during loading and unloading. Coast guard officer may also be a part of monitoring elements. For specific case police may also present.

On the land side monitoring is done by dangerous goods sub division of port of Surabaya together with coast guard officer and fire officer.

This is not easy to be done since there are lack of competent officers for monitoring the dangerous cargoes in port of Surabaya. Moreover the standard of monitoring system is necessary to formulate.

The weaknesses can be seen by the untidy recording system on the dangerous goods handled.
The “dual” authorities for supervising and monitoring, create a certain problems in view that the responsibility is not clearly defined, and no law or regulation dealing with this has been issued. The old reference is still being used.

Emergency Response

Port of Tanjung Perak has not been prepared for emergency situations. It has no contingency plan, response organisation/responsibilities, facilities and equipment and personnel specifically dedicated for dangerous good accidents.

The only existing response plan is a fire emergency plan. However this is general fire emergency plan and not specifically intended for dangerous cargoes incident. The existing fire emergency plan is not integrated for the whole area of the port. Evacuation sites are not determined and prioritisation of area to be secured is not identified.

The existing fire emergency plan only shows the procedure of reporting and process of evacuation, and lists of the important people to be saved at the first hand. Training is very rarely done.

Training on Handling of Dangerous Goods

Until recent time there is not any training facilities in port of Surabaya concerning the handling of dangerous goods. The kind of training held is a course on labour safety and health with only a little discussion on dangerous goods.
5.1.1.3 Ship Calls and Cargo Handled

Port of Tanjung Perak Surabaya is one of the four biggest international ports in the country. As many as 30 ships called and as much as 17,667 tons of cargo was handled in the port per day in 1994. It is projected that ship's call will increase by 1.5% yearly, and that cargo handled will rise by 5.0% by general cargo, and 15.0% by container per year until 2002. (Balitbang, 1994)

Kinds and numbers of vessels calling the Port from 1990 to 1994 can be described as follows:

Table 7: vessels calls to Port of Surabaya from 1990 to 1994

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ocean going</td>
<td>Unit</td>
<td>2,464</td>
<td>3,294</td>
<td>3,905</td>
<td>4,225</td>
<td>4,644</td>
</tr>
<tr>
<td></td>
<td></td>
<td>000Grt</td>
<td>13,094</td>
<td>14,069</td>
<td>15,711</td>
<td>19,274</td>
<td>23,178</td>
</tr>
<tr>
<td>2.</td>
<td>Domestic</td>
<td>Unit</td>
<td>3,434</td>
<td>3,452</td>
<td>4,581</td>
<td>4,668</td>
<td>4,991</td>
</tr>
<tr>
<td></td>
<td></td>
<td>000Grt</td>
<td>8,860</td>
<td>7,127</td>
<td>8,618</td>
<td>8,935</td>
<td>13,184</td>
</tr>
<tr>
<td>3.</td>
<td>Sailing boat</td>
<td>Unit</td>
<td>5,129</td>
<td>5,124</td>
<td>4,403</td>
<td>4,121</td>
<td>3,932</td>
</tr>
<tr>
<td></td>
<td></td>
<td>000Grt</td>
<td>762</td>
<td>762</td>
<td>879</td>
<td>1,047</td>
<td>620</td>
</tr>
<tr>
<td>4.</td>
<td>Special Ship/tanker</td>
<td>Unit</td>
<td>925</td>
<td>930</td>
<td>1,102</td>
<td>1,141</td>
<td>981</td>
</tr>
<tr>
<td></td>
<td></td>
<td>000Grt</td>
<td>5,435</td>
<td>5,286</td>
<td>5,373</td>
<td>5,265</td>
<td>4,596</td>
</tr>
<tr>
<td>5.</td>
<td>Pioneer Ship</td>
<td>Unit</td>
<td>45</td>
<td>26</td>
<td>31</td>
<td>46</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>000Grt</td>
<td>21</td>
<td>17</td>
<td>14</td>
<td>19</td>
<td>16</td>
</tr>
</tbody>
</table>

(Source: Port of Surabaya 1995)
Table 8: Cargo handled in Port of Tanjung Perak Surabaya 1990 - 1994

<table>
<thead>
<tr>
<th>YEAR</th>
<th>INTERNATIONAL TRADE</th>
<th>INTER ISLAND TRADE</th>
<th>TOTAL CARGO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IMPORT %</td>
<td>EXPORT %</td>
<td>UNLOADING %</td>
</tr>
<tr>
<td>1990</td>
<td>3,144,871</td>
<td>24</td>
<td>2,212,647</td>
</tr>
<tr>
<td>1991</td>
<td>4,068,972</td>
<td>27</td>
<td>2,343,945</td>
</tr>
<tr>
<td>1993</td>
<td>4,782,001</td>
<td>28</td>
<td>3,690,481</td>
</tr>
<tr>
<td>1994</td>
<td>8,358,270</td>
<td>38</td>
<td>3,275,698</td>
</tr>
</tbody>
</table>

(Source: Port of Tanjung Perak, 1995)

5.1.2 Dangerous Goods Related Transport

Petroleum products and natural gas, chemical and its products, forestry, and other mining and quarrying products are the four major commodity groups, which occupy about four fifths of the total cargo handling volume in Indonesia. This commodity trend has been maintained during the past five years. Shares by these major commodity groups in 1994 are:

- Petroleum and gas : 54%
- Chemicals and its products : 9.5%
- Miscellaneous : 9.5%
- Forestry : 8.5%
- Other mining and Quarrying products : 7.5%
- Estates : 3.4%

Chemical products are divided into 25 sub categories such as fertilizer, cement, paper, and salt. In the same year the total chemicals products throughput totalled about 28 million tons or occupy 9.5% shares of all commodities. Cement and fertilizer are the main commodities in this group for inter island trade.
The shares of cargo volumes handled in Port of Tanjung Perak Surabaya were 14.2% for international trade and 12.9% for interisland trade in 1990, but the share has declined for the past five years.

The amount of the dangerous goods handled in Port of Surabaya from 1991 to 1995 are depicted in the following table.

Table 9: Discharging and Loading of Dangerous Goods in Surabaya 1991 to 1995

<table>
<thead>
<tr>
<th>YEAR</th>
<th>DISCHARGING</th>
<th>LOADING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>319,146.429</td>
<td>211,235.660</td>
</tr>
<tr>
<td>1992</td>
<td>397,930.432</td>
<td>261,543.537</td>
</tr>
<tr>
<td>1993</td>
<td>448,873.777</td>
<td>348,410.888</td>
</tr>
<tr>
<td>1994</td>
<td>449,575.389</td>
<td>348,032.439</td>
</tr>
<tr>
<td>1995</td>
<td>546,786.748</td>
<td>250,256.856</td>
</tr>
</tbody>
</table>

(Source: Port of Surabaya, 1996)

The major dangerous cargoes loaded and unloaded in Port of Surabaya represent almost the classes in the IMDG Code. This means that the dangerous cargoes in the Port are already very complex in their types.
Table 10: Dominant Dangerous Goods Loaded and Unloaded In Port of Surabaya

<table>
<thead>
<tr>
<th>CLASS</th>
<th>NAME</th>
<th>CLAS</th>
<th>NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dynamite, Detonator, Ammonium Nitrate</td>
<td>1</td>
<td>Explosive</td>
</tr>
<tr>
<td>2</td>
<td>Oxygen, LPG, Ammonia, Acetylene, CO2, Chlorine, Argon</td>
<td>2</td>
<td>CO2</td>
</tr>
<tr>
<td>3</td>
<td>Paint, Thinner, Asphalt, Alcohol, Formaline, Methanol</td>
<td>3</td>
<td>Paint, Varnish, Methanol, Adhesive, Extracts, Essence, Flavour Compound, Perfumery products, Phenol, Ethyl Butyrate</td>
</tr>
<tr>
<td>4</td>
<td>Calcium Carbide, Matches, Kapok</td>
<td>4</td>
<td>Copra, Cotton, Fish meal, Jute, Waste paper, Sulphur, Acetylene black, Calcium Carbide</td>
</tr>
<tr>
<td>5</td>
<td>Caphorite, Pottasium Chloride, Hydrogen Peroxide</td>
<td>5</td>
<td>H2O2, Potassium Chlorate, Caphorite, Sodium Nitrate, Sodium Sulphide</td>
</tr>
<tr>
<td>6</td>
<td>Pesticides</td>
<td>6</td>
<td>Pesticides, Insecticides</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Hydrogen Chloride, Sulphuric Acid, Battery Fluid</td>
<td>8</td>
<td>Nitric Acid, Caustic Soda</td>
</tr>
<tr>
<td>9</td>
<td>-</td>
<td>9</td>
<td>Asbestos, Pthalic Anhydrate, Bleaching powder, Coal</td>
</tr>
</tbody>
</table>
Table 11: Number of Containers Containing Dangerous Goods Period Jan- July 1995

<table>
<thead>
<tr>
<th>No.</th>
<th>Month (ships)</th>
<th>Number of Containers per Classification of IMO</th>
<th>Sub Total</th>
<th>Total (Box)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1.</td>
<td>Jan</td>
<td>59</td>
<td>107</td>
<td>244</td>
</tr>
<tr>
<td>2.</td>
<td>Feb.</td>
<td>53</td>
<td>112</td>
<td>421</td>
</tr>
<tr>
<td>3.</td>
<td>March</td>
<td>41</td>
<td>43</td>
<td>450</td>
</tr>
<tr>
<td>4.</td>
<td>April</td>
<td>57</td>
<td>22</td>
<td>631</td>
</tr>
<tr>
<td>5.</td>
<td>May</td>
<td>52</td>
<td>114</td>
<td>827</td>
</tr>
<tr>
<td>6.</td>
<td>June</td>
<td>58</td>
<td>21</td>
<td>2041</td>
</tr>
<tr>
<td>7.</td>
<td>July</td>
<td>54</td>
<td>12</td>
<td>465</td>
</tr>
</tbody>
</table>

Note 1/2 means one container 40'/two containers 20'
(Source: Port of Surabaya, 1995)

It is recorded that from January to May 1995, as much as 89% of container- loaded ships calling the Port carried dangerous cargoes. 1.6% of total container 20' and 1.6% of total container 40' contained dangerous cargoes.

5.1.3 The Main Sea Lanes for Dangerous Goods Transport

Port of Surabaya plays an important role as a hub port in Indonesia, particularly for ports in eastern part of Indonesia.

There has not yet specific data on the main sea lanes for dangerous goods transport in the port of Surabaya and its surrounding, since incoming and outgoing cargo ships are mostly carries dangerous goods as parts of its cargoes.
To have a picture of the magnitude of dangerous cargo routes, a reference is made to the inter-island main shipping route, as shown in the appendix 5.

From the figure the following issues can be observed:
- the major routes (with more than 1000 annual trips) are: Surabaya (Tanjung Perak), Jakarta (Tanjung Priok), and Surabaya - Ujung Pandang;
- the medium routes (400 - 1000 annual trips) are: Surabaya - Samarinda, and Surabaya - Samarinda;
- the smaller shipping routes (200-400 annual trips) are Surabaya - Banjarmasin, Surabaya - Kendari, and Surabaya - Sorong - Biak - Jaya Pura;
- the minor routes (less than 100 annual trips) are: Surabaya - pangkalan Bun, Surabaya - Sampit, Surabaya - Kota Baru, and Surabaya - Maumere - Ambon - Fakfak.

Regarding the domestic container cargo flow in surabaya, the port of Surabaya is the hub port for last port of call in, and the first port of call in Ujung Pandang, Banjarmasin and Ambon. The following figure can be given.

Figure 12: Surabaya as Hub Port

<table>
<thead>
<tr>
<th>Last Port of Call in</th>
<th>Hub Port</th>
<th>First Port of Call Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ujung Pandang (64.7%)</td>
<td>Surabaya</td>
<td>Ujung Pandang (64.7%)</td>
</tr>
<tr>
<td>Banjarmasin (34.9%)</td>
<td></td>
<td>Banjarmasin (34.9%)</td>
</tr>
<tr>
<td>Ambon (0.4%)</td>
<td></td>
<td>Ambon (0.4%)</td>
</tr>
</tbody>
</table>

(Source: JICA, 1993)

In the absence of the shipping lanes information, the only available information is the lanes within the port approaches. to give more realistic approach to analysis of the risk area in port area, an approach to the port is used as reference.
This is considering that during the last six years, 128 out of 214 maritime accidents happened in the port's basin. (see section 5.1.4).

The figure of the approaches to port of Surabaya is attached in appendix 6, together with the marking of area of dangers within the port basin.

It can be said up to this point that port area contingency planning is very feasible to be established in port of Surabaya. This is when regarding the distance of the location where the majority of accidents happened, and the equipment of SAR ships of Surabaya Coastguard.

5.1.4 Maritime Accidents in and near Surabaya Port

Maritime accidents keep happening in Port of Surabaya. The following table shows the record of the accidents, which occurred from April 1990 to May 1996.

Table 12: The Maritime Accidents in Port of Tanjung Perak Surabaya

<table>
<thead>
<tr>
<th>No</th>
<th>YEAR</th>
<th>LOCATION</th>
<th>VICTIM/LOSS</th>
<th>TYPES OF ACCIDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A1</td>
<td>A2</td>
<td>A3</td>
</tr>
<tr>
<td>1.</td>
<td>90-91</td>
<td>70</td>
<td>41</td>
<td>22</td>
</tr>
<tr>
<td>2.</td>
<td>91-92</td>
<td>17</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>3.</td>
<td>92-93</td>
<td>5</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>93-94</td>
<td>10</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>5.</td>
<td>94-95</td>
<td>13</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>95-96</td>
<td>13</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>128</td>
<td>86</td>
<td>64</td>
<td>144</td>
</tr>
</tbody>
</table>

(Source: Port of Tanjung Perak Surabaya, 1996)

Legend: A1: Inside port basin
         A2: Outside port basin
A3 : Inside Surabaya
A4 : Outside Surabaya
B1 : Crews live's
B2 : Passanger's live
B3 : Properties (S... = numbers of ships)
C1 : Lost
C2 : Sinking
C3 : Fire
C4 : Grounding
C5 : Collission
C6 : Touching
C7 : Broken Engine
C8 : Others.

It can be seen from the data that all of the accidents might be caused by human error.

5.1.5 dangerous Goods Discharges Incidents

Maritime accidents involving dangerous cargoes can be seen in the following table.
Table 13: Accidents of Dangerous Goods in and near the Port of Surabaya

<table>
<thead>
<tr>
<th>No.</th>
<th>Year</th>
<th>Types</th>
<th>Causes</th>
<th>Location</th>
<th>Loss/Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1980</td>
<td>Fire</td>
<td>combustion by copra</td>
<td>Kalimas Wharf</td>
<td>5 warehouses destroyed</td>
</tr>
<tr>
<td>2.</td>
<td>1986</td>
<td>Toxic</td>
<td>Toxic by Hydrocarbon derivative. There was no label on the packages, besides the substance was not identified in IMDG Code</td>
<td>On board motor vessel “Niaga XXXVIII” and onboard motor vessel “Pulau Kalimantan” in the approaching channel</td>
<td>10 people poisoned</td>
</tr>
<tr>
<td>3.</td>
<td>1990</td>
<td>Fire</td>
<td>Unidentifiable</td>
<td>In a truck on wharf</td>
<td>1 pallet of matched burned down</td>
</tr>
<tr>
<td>4.</td>
<td>1990</td>
<td>Explosion</td>
<td>Residue of electrolyte acid gas from scrapped battery</td>
<td>On board motor vessel COCL ARROW in the approaching channel.</td>
<td>2 containers damaged.</td>
</tr>
<tr>
<td>5.</td>
<td>1993</td>
<td>Fire</td>
<td>Combustion</td>
<td>On board motor vessel “Sinar” in the approaching channel</td>
<td>Vessel sunken</td>
</tr>
<tr>
<td>6.</td>
<td>1994</td>
<td>Fire</td>
<td>Direct reduced iron</td>
<td>On board motor vessel “Ocean Garce”</td>
<td>Damaged to some cargoes</td>
</tr>
<tr>
<td>7.</td>
<td>1994</td>
<td>Fire</td>
<td>Reaction of Sodium Hydrosulphide</td>
<td>Inside a warehouse</td>
<td>Damaged of goods</td>
</tr>
</tbody>
</table>

(Source: Port of Surabaya, 1996)

The table indicates that most of the accidents were of human errors. In this case the training of personnel handling, loading, unloading, stowing, labelling, marking have to be given a certain training related to dangerous cargo management.
This have to be realised by the safety and pollution management in the first place, rules and regulation should be formulated. Implementation and controlling is to be established adequately.

The fact that there has not yet any rules and regulation concerning the training, monitoring, and management of dangerous cargo for the people involved in the transporting and handling of such cargoes may open the higher possibility for the accidents to happen.

5.2 Geographical Risk analysis

5.2.1 Ecosystem Information and Marine Transport

Proper ecosystem information about the ecological aspects and habitats, flora and fauna have to be documented in order to help detecting sensitive area to the effect of dangerous cargoes accidents.

This together with the marine transport information, namely ship’s routing should be made available and be incorporated with other aspects of informations such as quantity of the dangerous substance discharges, its types, weather conditions, maritime traffic density, vessels condition, and so forth. The inclusions of such an inventory will enhance the precision of risk assessment.

In the water area of Surabaya port there has not been much information rather than information about the water quality of rivers and waters in the port’s approaches and surrounding waters. There is also indication of a fishery area within the approach, plus some mud area is also indicated.
Sampling of water quality for several areas within the approaching channel was done in 1992. The result is put on a table. This will be given in Appendix 7

Appendix 8 cites the locations of sampling area, area of fishery, and mud area.

Some important issues to be discussed from the results of the water quality in six sampling areas are:

- the water in sampling areas is so much acid, pH between 3.75 and 4.72 (normal pH between 6 and 9);
- BOD (Biological Oxygen Demand) in sampling areas are very high, between 48 and 91 (normal BOD is 45, unit Mg/l)

With respect to the effect of the discharges of acid substances problems may appear if the discharge is in large amount. This can add the acidity in the water that might be reasonable causes for the disturbance of marine organisms affected.

BOD might increase when for example a considerable number of phosphate fertilizer falls into the water.

This kind of information should exists and combined with others necessary to make an analysis for the risk and its management, including contingency planning.

This will be combined with the ships routing in the port of Surabaya as to know the probability and preparedness to be provided in case accidents happens.

Scenarios is important to draw in order that a contingency plan can be formulated.
5.2.2 Mapping, Priorities and Response Preparedness

Based on the information mentioned previously, mapping, priorities and response preparedness can be done in more efficient and effective ways if all information are available. To do this a standard should be made in respect to the considerations of socioeconomic, legal and environmental aspects.

The purpose of this standardization is to make everyone understand clearly and have the same perceptions of areas to be prioritized and protected against the dangers of dangerous substances discharges. In this way cooperation can be enhanced to the preparation of contingency plan in a reliable emergency and pollution control system.

5.3 Existing Situation in Surabaya Port

With respect to ecosystem information, mapping priorities, there has not yet any initiative to do so. A study should be made in order to prepare this if effective contingency planning for dangerous cargo is to be achieved.

The fact that today the port does not have any call of chemical tankers ships might be a strong reason of not doing this. The scale of impact of accidents of chemicals or dangerous goods carried in packaged forms are very rarely a big one.

Change however should be started, considering that:

- the volume of dry bulk dangerous cargoes is increasing in volume
- the continue happening of accidents involving dangerous cargo
- the prediction that the industry in the hinterland in the near future will develop a great need of liquid dangerous chemicals, that bulk chemicals have to call the port in the future.
An analysis of the important areas to be prioritized in emergency response plan can not be done perfectly, since the existing information is not yet adequate, they only include:
- map of port approaches;
- identified fishery areas;
- identified mud area;
- identified mines areas;
- identified water quality in sampling areas.

- wind direction
- wind speed
- water temperature

Prof. Sampson identified specific designed Environmental Impact Assessment in order to identify marine sensitive areas which as well fits the purpose of contingency planning’s demand for hazard identification. (Sampson, 1996:2)

5.4 Inventory of Response Equipment

Response equipments refer to any equipments available which are prepared and used to response to accidents involving safety and pollution in Port of Surabaya and its surrounding area, both at sea and on land.

Three sources are identified as basic providers of such equipments, namely Coast Guard Surabaya Base, Port of Surabaya, and Oil State Company (Pertamina). The following response equipments are found in Coast Guard Surabaya base:

Pertamina oil terminal in Port of Tanjung Perak Surabaya has a depository of equipments for oil spill combatting. The consideration of defining Pertamina as a
source of equipments for responding dangerous goods accidents is based on the consideration that many of dangerous substances has the similar characteristics with that of oil. So in this respect the techniques and equipments to combat oil spill may be applicable.

Table 14: Inventory of Equipments in Pertamina Oil Terminal Surabaya

<table>
<thead>
<tr>
<th>No.</th>
<th>Types of Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Oil Boom Taiyo Kogyo</td>
<td>500 metres</td>
</tr>
<tr>
<td>2</td>
<td>Oil Boom Slickbar MK 10</td>
<td>500 metres</td>
</tr>
<tr>
<td>3</td>
<td>Oil Skimmer Cyclonet 050</td>
<td>1 Unit</td>
</tr>
<tr>
<td>4</td>
<td>Oil Skimmer Komara MK2</td>
<td>1 Unit</td>
</tr>
<tr>
<td>5</td>
<td>Oil Skimmer Vikoma 30 K</td>
<td>1 Unit</td>
</tr>
<tr>
<td>6</td>
<td>Skimmer Pharos GT-185</td>
<td>1 Unit</td>
</tr>
<tr>
<td>7</td>
<td>Oil Bag (2,500 galons)</td>
<td>1 Unit</td>
</tr>
<tr>
<td>8</td>
<td>Oil Bag (800 galons)</td>
<td>1 Unit</td>
</tr>
<tr>
<td>9</td>
<td>Dispersant Pump</td>
<td>1 Unit</td>
</tr>
<tr>
<td>10</td>
<td>Pollution Craft</td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>(Slickbar + outboard motor)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Rubber Boat Achilless SHD 170</td>
<td>1 Unit</td>
</tr>
<tr>
<td>12</td>
<td>Outboard Motor</td>
<td>1 Unit</td>
</tr>
</tbody>
</table>

(Source: Pertamina Oil Terminal Surabaya, 1996)

These equipments are very well maintained and ready to deploy by team of trained personnel to combat oil spill. Pertamina are obliged to give necessary assistance and equipments whenever an oil spill accident happens under the request of the Port Administrator.

Transport and logistic problems may arise however in case the accident happen after certain distances from their depository place.
The amount of booms, skimmer and other auxiliary supports may not be enough with regard to bigger events of spills. The fact that the variety of equipments exists is a factor to be consider when preparing local contingency plan in order to standardize such equipments as to ineffectiveness and inefficiency.

Port of Surabaya provides the following facilities and equipments

Facilities concerning Port Hospital with capacity of 75 beds, ambulances, emergency room, 24 hours service medical doctors and specialists, and medical radio.

Port fire brigade equipped with:

- hydrants
- reservoir
- fire pump truck “Werdau”, 1961
- fire pump truck “Werdau”, 1963
- fire fighter truck “Izuzu” 1972 (2)
- fire fighter truck “Hino”, 1975
- fire fighter truck “Izuzu”, 1985
- fire fighter truck “Tohatzu”, 1992
- breathing apparatus “Sarbe”, 1992
- fire cloth (3 units)
- hot jackets (15)
- dedicated tug boats “Bima IV and V” (each has capacity of 2,400 HP)

Some storehouses are equipped with:
- Fire extinguisher (CO2);
- Fire extinguisher (poisonous fire)
- other tools (empty bags, hoked sticks, axe, sand, water tube)
Other equipments which can be mobilized are:
- 7 tug boats, 2,400 HP each
- 7 pilot boats, 350 - 960 HP (various)
- 5 mooring boats, 125 - 250 HP (various)

The Coast Guard of Port of Surabaya has some depository of rescue equipments.

- Diving equipments:
  - Snorkel (11)
  - Wet suits (11)
  - Underwater light (11)
  - Chemical light (11)

- Rescue equipments:
  - Helmet (11), Ranger rope (11), Carabiner (11), and Ranger gloves (11)
  - 5 patrol vessels of (10 -37) DWT, each is equipped with 4 litres of CO2

For communication system, the Port Coastguard operate a coastal station with the frequency bands MF, HF, VHF, radiotelephony in 24 hours a day. It is also planned in 1993 that there would be installed Digital Selective Calling (DSC) System for A3 sea areas at Surabaya.

It is planned that Surabaya will be given more capable SAR ships and patrol vessels. The number, specification technics of the planned ships to be deployed for Surabaya Base further described in the following tables.

Table 15: SAR Ships Deployment Plan for Coast Guard Surabaya Base

<table>
<thead>
<tr>
<th>Ship Class</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>I - A</td>
<td>2</td>
</tr>
<tr>
<td>I - B</td>
<td>-</td>
</tr>
<tr>
<td>II</td>
<td>3</td>
</tr>
<tr>
<td>III</td>
<td>(1)</td>
</tr>
<tr>
<td>IV</td>
<td>2(3)</td>
</tr>
<tr>
<td>V</td>
<td>3(2)</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

(Source: DGSC, 1993)
Table 16: Principal Particular of SAR Ships

<table>
<thead>
<tr>
<th>Item/Class</th>
<th>I - A</th>
<th>I - B</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coverage</td>
<td>All water</td>
<td>All water</td>
<td>All water</td>
<td>Coastal water</td>
<td>Coastal water</td>
</tr>
<tr>
<td>Cruising range (mile)</td>
<td>5,000</td>
<td>3,000</td>
<td>520</td>
<td>350</td>
<td>200</td>
</tr>
<tr>
<td>Length (meter)</td>
<td>74</td>
<td>59</td>
<td>35</td>
<td>24</td>
<td>18</td>
</tr>
<tr>
<td>Breadth (meter)</td>
<td>10</td>
<td>8</td>
<td>6.3</td>
<td>6</td>
<td>4.3</td>
</tr>
<tr>
<td>Depth (meter)</td>
<td>5</td>
<td>4.5</td>
<td>3.4</td>
<td>2.85</td>
<td>2.3</td>
</tr>
<tr>
<td>G/T (ton)</td>
<td>1,000</td>
<td>500</td>
<td>100</td>
<td>93</td>
<td>37</td>
</tr>
<tr>
<td>Main Engine (PS)</td>
<td>1,500 X 2</td>
<td>1,300 X 2</td>
<td>400 X 2</td>
<td>540 X 2</td>
<td>450 X 2</td>
</tr>
<tr>
<td>Speed (knot)</td>
<td>15</td>
<td>15</td>
<td>26</td>
<td>16</td>
<td>21</td>
</tr>
<tr>
<td>Helicopter</td>
<td>1 Unit</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Deck &amp; stabilizing tanks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Towing Gears</td>
<td>1 Unit</td>
<td>1 Unit</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Foam Concentrate</td>
<td>.2 tons</td>
<td>.2 tons</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fire Fighting Devices</td>
<td>30 set</td>
<td>30 set</td>
<td>10 set</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Oil-boom Chemical Dispersant</td>
<td>400 metres</td>
<td>200 metres</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Handy Oil Recovery Devices</td>
<td>10 set</td>
<td>10 set</td>
<td>5 set</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Safety Devices for Dangerous chemicals</td>
<td>3 set</td>
<td>3 set</td>
<td>2 set</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Gas Indicators</td>
<td>2 set</td>
<td>2 set</td>
<td>2 set</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

(Sources: DGSC, 1993)

The design of ship class I-A and I-B type is attached in the appendix 9
In addition Surabaya Coast Guard Base will be endowed with two helicopters, with following specifications:

- Operational : 3 - 3.5 operational hours
- Conditions : max. capacity 15 people
- Cruising Speed : 135 kt
- Endurance : 450 miles and over
- Operation Radius : 170 miles

Furthermore, there are some equipments stored in Naval Base of Tanjung Perak, the detailed are not mentioned, but they are ready to deploy under the requests of Port administrator.

5.5 Existing Technical Guidelines and Standard

There is an unofficial and unpublished guideliness on handling of dangerous goods in port of Surabaya. This includes the classifications, packaging, marking, labelling, segregating, storage, transferring, and also the emergency guide to dangerous goods accidents. It seems to me that this guideliness is a translation products of IMDG Codes. It is compiled in such a way that it incorporates four volumes of the IMDG Code and the MFAG of IMDG Code. This unpublished guideliness is comprehensive enough, but it does not include Marine Pollutant in its classification.

5.6 Response Planning

Depending on the coverage of area in accordance with response capabilities, different levels of contigency plan can be developed. The scope and the details will be different for each level but standard should be established and followed if higher level of plan to be worked out successfully. There exists local levels, province
levels, national levels, and regional-international level. Ideally the contingency plan should be developed at all levels.

5.6.1 Local Level Contingency Plan

Contingency plan refers to an assessment of potent incidents and the development of predetermined sequence and events to deal with them. (Hosty, 1992:1). A local level contingency plan is the basic of the higher levels of contingency plans. A response personnel should know the risk to face and the place and resources he has to get access with to have the necessary equipments, expertise, and so forth.

A development of local level contingency plan is basically suited to the need of the local interests. However it needs to pay attention of its possibility to become a part of province levels, national levels and even regional-international levels.

Despite the existence of oil terminal in one of its berths (owned by Pertamina), Port of Surabaya has neither contingency plan for oil spills nor for dangerous goods.

So far local contingency plan for dangerous goods has not yet exists in any Indonesian ports. However Some ports have already established local contingency plan for oil spills, particularly those ports which are being used dominantly as oil terminals.

They have established standing procedures which is promulgated by various kinds and levels of decrees. Some of them have standing procedures by decrees of Head of Regional Office of Ministry of Communications, some by Port Administrators, and others(oil terminals) by the Heads of PERTAMINA units.
The standing procedures identifies the local response center (Port Administrator), province response center (Head of Regional Office of Ministry of Communications), and the national response center (Directorate General of Sea Communications).

They also defined the relevant organisations and designated officials to be contacted, system and procedures for communications. Concerning the response operations they describe the organisation of task, and contain task descriptions for each designed official.

Port of Surabaya as the second biggest port in Indonesia as well as hub port for those ports in eastern Indonesia, needs to develop local contingency plan for dangerous goods and oil as well.

5.6.2 Considerations

The following are considerations which arises from the existing local levels contingency planning which can be learned by Port of Surabaya when developing its contingency plan.

- Those existing contingency plans for oil spills, although detail the capability of responding to oil spills, they do not count for their possibility to be involved in higher levels of incidents. They seem developed isolatedly.

- They solely consider their development on the basis of oil spills occurrences originated from their activities only, and not for other possibilities of oil spill incidents from other activities in port area.

- They have not involved the consideration of marine sensitive area to be protected
- They do not involve public relation function.

The most important consideration is that for regional and international level, a national contingency plan is required. Such as in OPRC 1990 which will be developed in its scope to include hazardous materials.

Therefore it is a need to develop guidelines for local contingency plan with respect to IMO recommendations and manuals for contingency plan.
Based on the previous discussion, a proposal for the development of a contingency plan for dangerous goods in port of Surabaya is put forward.

Contingency plan refers to an assessment of potential incidents and the development of predetermined sequence and events to deal with them. (Hosty, 1992:1).

Regarding the above definitions it can be interpreted that the assessment of the risk is the main factor encompassing the subsequent activities of the whole process of the establishment.

According to Prof. Pardo (1994: 3) a contingency plan should have the elements which includes:
- definition of institutional and personal responsibilities;
- Assignment of resources: Response equipment, personnel, economic support and appropriate logistic structures;
- Guidelines and recommendation for actions and;
- Basic information on the port installations, substances handled, resources and personnel at risk and available external logistic support.

Based on the previous discussions, some important issues should be considered in order to establish adequate contingency planning for dangerous goods in port area of Surabaya.
First the fact that there is inadequate national regulations neither on dangerous cargo handling nor on the provision for contingency planning for dangerous goods. This condition is also the same with that local in house port rules.

Second there is not adequate information about the marine sensitive areas in port of Surabaya which is very important to identify existing hazards to the marine environment.

Third, the existing appropriate equipments are not sufficient enough to deal with dangerous goods accidents.

Fourth, the lack of qualified personnel will create also problems to deal with dangerous cargoes incidents

Fifth the fact that berths used for loading and unloading of dangerous cargoes are not centralised is a hindrance.

Sixth the absence of relevant regulation for liability compensation for dangerous cargoes accident contribute the factor of difficulties.

Seventh the weak monitoring system and dual responsible bodies to deal with dangerous cargoes arise confusions in the line of responsibility.

However, it is feasible to have some initiatives to try to propose a contingency plan for port area of Surabaya, on the basis of:

-the draft of Presidential Decree for national contingency plan which defines the line of responsibility and authorities of the assigned legal bodies;
- the function of the Port Administration Office;
- the plan of equipment supplies for Coast Guard Surabaya
- number of Coast Guard personnels;
- existing data concerning marine environment in port of Surabaya;
- an expert (marine biologist) working for port of Surabaya;
- the availability of nearby help from naval academy base for helicopter and vessels deployment;
- the inventory of oil spill response equipment by Pertamina (state oil company)
- the functions of Port of Surabaya and its existing facilities and equipments inventory;
- the existence of fire brigade, port police, and other related bodies within the port jurisdiction.
- the assistance might be rendered by Surabaya based-Coast Guard Fleet.

6.0 Objectives

The objective of the contingency planning for dangerous goods in port of Surabaya is to develop a preparation of an effective and continuous response system to dangerous goods accidents which is able to:

- anticipate and execute response properly, to any incidents of dangerous goods in the port and other areas under its jurisdiction;
- become a part of a higher levels of contingency planning system.

6.2 Definition of Authority

- Port Administrator is responsible to issue a decree promulgating the contingency planning for dangerous goods in port area of Surabaya.
- Port Administrator is responsible for the management of Local Response Centre.

- Port Administrator of Surabaya takes the responsibility of actual physical control of response in the port area. He evaluates the report of an accident, forward the report to the Regional Head Office of MOC and acts to supervise and coordinates all of the potent sources units in the port of Surabaya area. He activates and deactivates the response operations.

- Head of the Coast Guard Department is responsible as the internal and external contact point between Port administrator and On Scene Coordinator. He has the authority to give command and instruct the On Scene Coordinator.

The idea of the position is to make an easy contact between Port Administrator and On Scene Commander.

- Head of the Operation Section of the Coast Guard Department act as On Scene Commander. He coordinates the deployment of all resources, i.e., has the functions of coordinating the operational teams together with the resources.

- Operational team are coordinated personnel which are provided with necessary equipments for responding to incidents involving dangerous goods in the Port of Surabaya. The operational team consists of fire fighting team, pollution team, salvage team, rescue team, administration team, logistics team.

- Fire fighting team comprises of members of Surabaya based Coast Guard personnel, fire brigade personnel of Port of Surabaya.

- Pollution team consists of Surabaya based Coast Guard personnel and Pertamina oil spill response personnel.
- Salvage team consists of personnel of Port of Surabaya and Surabaya based Coast Guard personnel.

- Logistics team consists of Pertamina personnel, Port of Surabaya personnel, and Surabaya based Coast Guard personnel.

- Rescue team consists of Surabaya based Coast Guard personnel.

- Administration team consists of Port Administration Office personnel.

6.2 Command Structure

The proposed command structure for contingency planning on dangerous goods is described in appendix 10

6.3 Activation of the Plan

Activation of the plan based on the report of incident received and evaluated by stand by officer, Port Administrator Surabaya, or contact point. If the receiver of the report is the contact point, he is obliged to forward the report to Port Administrator Surabaya or the stand by officer.

On Scene commander will make an evaluation of the report of the incident and will decide the actions to be taken as follows.

- For a small scale incidents, the response will be carried out directly by the operation team from its own unit.

- For medium scale incidents, the response will need OSC to organised the operation team from other units
- For large scale incidents, the response action will be directly handled by the OSC by maximum capability and resources available.
- OSC will contact the Head of Regional Office of Ministry of Communication through Port Administrator for assistance, when the incidents can not be dealt with at the local level
- Operation will be declared over if incidents are already manageable

In this respect if possible reporting system is to be introduced to those likely encountered with dangerous cargoes incidents.

6.4 Reporting

Any response activities/operations have to be reported according to the agreed reporting standard.

A response activity in a small scale which is done by individual unit has to be reported to the Port Administrator

A response carried out under the coordination of and direction of the OSC will be reported by Port Administrator.

The already verified report will be furthered to the Directorate General of Sea Communications.

The standardised reporting format has to be prepared by Port Administrator.

6.5 Communications
An Emergency Response Centre will be set up in the Port Administrator Office. It functions as main focal point for internal and external communications particularly during response operations, operating 24 hours a day.

Every working unit has to prepare standardised system and communication facilities enabling the fastest way of contact, and further the information on the incidents of dangerous goods in Port of Surabaya area. The standardised communication facilities which exist today are telephone, facimile, radio VHF, and courier.

Every contact point person have to make a notification of his availability and delegates this responsibility to other people who is competent when he is away.

Every organisation/unit should appoint person of contact point
For the smoothness of the operation, the communication system radio VHF using the joint frequency. This will be assisted by other existing communication facilities.

The computer system in Port of Surabaya will be utilised as data base system for emergency response as well. Today the program of ALOHA and CAMEO is available in the market and it means it can be learned also through the existing computers.

6.6 Operation
6.6.1 Sea operation

For sea operations there are 4 fixed Coast Guard vessels with main range of operations up to 12 miles from shore line and equipped with CO2 fire extinguishers. Sea operation will be directly conducted by the harbour patrol team of Coastguard and will be crewed by the specific rescue team with experience in combattting pollution and SAR.
These vessels are not to be boarded by other members of response team for the safety reason.

The members of this specific team is 6 persons. 5 trained for oil pollution and 1 trained for dangerous goods accidents at sea.

For assistance the patrol ships of the harbour master may also be used plus the tug boat deposited in the Port of Surabaya.

In this case each unit has to have a contact point who is experience enough to deal with the matter.

For the sake of the smoothness of the real operation exercise should be regularly conducted.

The pattern of operation should be formalised.

6.6.2 Air Operation

Air operation for incidents involving dangerous cargo at sea is the responsibility of the Port Administrator for purpose of evacuation of people on board, or other purposes in helping emergency response operations.

Naval base is responsible for providing air operation assistance.

Port Administrator submit report of the result and finance consequence to the Directorate General of Sea Communications.

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6.6.3 Recovery

Recovery activity will be decided by Port Administrator with the consideration of the hazard presents and the finance consideration.

Search and rescue unit is responsible for the actual recovery process.

Technical assistance from outside will directly under the responsibility of the Port Administrator.

The finance responsibility will be forwarded to Directorate General of Sea Communications by Port Administrator.

6.7 Coordination with other Bodies/Authorities

Coordination with other bodies and authorities will be done by Port Administrator of Surabaya through determined contact points. This particularly when the situation is very critical which needs to have an assistance from other authorities.

Port Administrator will make an agreement to this for an effective coordination. System of coordination will be worked out and evaluated periodically to make sure the worst probable conditions to encounter.

This kind of contact will be of necessity for their continuation. The tour of place and duties of the appointed contact person should be identified in advance and put into
signed agreement with other institutions. The changes of the organisation will also
effect the coordination process.

In order to be readily informed, it is necessary to have continuously updated:
- list of equipments and other resources (experts), and;
- list of key contact persons.

6.8. Logistics

Three main sources for logistics are identified, namely:
- Pertamina for the oil spill equipment and oil spill response team;
- Coast Guard for the rescue equipments and specific trained personnel for dangerous
cargoes accidents;
- Port of Surabaya for the tug boat and fire brigade.

All of the inventory available should be properly recorded and make known to every
unit involved in the response.

All of the inventory which has been put into lists have to be ready for deployment.
The locations, number, types, weight, size must be written down in the list. The
contact persons for the request or use of equipment should be included in a list of
contact person for emergency.

Other equipments needed to deploy such inventory should be listed.

Changes in specification of the inventory have to be notified.

Each unit should be responsible for its inventory for their readiness and maintenance
Mobilization of the equipment to be utilised for area outside the Port have to be approved by the OSC

6.9 Administration

Administration will be carried out by staff of Port Administrator.

Administration has to be regularly reported and reviewed. It will include the report of operation, equipment mobilized, expenses made, personnel involved, and do forth.

There will be a legal division in the administration which function to settledown the liability compensation of the clean up operations.

The system of administration should be known by all parties concerned. Administration in each unit has to follow the similar system formalised.

OSC will coordinate all the administration, and will be Reported to port Administrator to be furthered to Directorate General of Sea Communications.

6.10 Public Relations

Port Administrator will provide specific telephone line for public relations activity.

The designated persons to deal with public relations will be Port Administrator, contact point and OSC.

All the development during the response operations should be communicated between OSC and Port Administrator.
An expert of public relations will be stationed and specific team designated to monitor and survey the situation of the public reaction on the response operations.

Port Administrator will be responsible for the whole public relations activity.
This chapter will deal with the conclusion and recommendations relating to the existing situation and condition in the Port of Surabaya and the necessity to develop proper local port contingency plan for dangerous goods.

The maritime accidents and land site accidents involving dangerous goods have happened in the port of Surabaya. Most of the maritime accidents occurred in the port approaches and port basin.

The port needs to develop proper preventive and emergency response system for such incidents in order to minimise the impact on the human lives, environment and properties.

This should be done in the right manner with the right concept. Some lessons can be learned as a reference so that mistakes will not be conducted in establishing local port area contingency plan to be developed.

The existing contingency planning for oil spill response in several Indonesian ports bear some deficiencies. They do not address the environmental sensitive areas, the function of public relations, and hierarchy of the authorities to approve the plans.
Most important deficiency is the misconception of establishing the contingency plan which only local minded plan for the sake of individual needs and interest, which means they do not consider about being a part of the total national contingency plan.

This is due to the absence of national regulations for contingency plan and ignorance or non existence of reliable guidelines.

From this point of view, the port should initiate measures which can maximally protect the port and its environment from the destructive impacts of dangerous goods incidents.

Most importantly if the correct measures are done by the port, it in the long run is expected to be able to stimulate the presence of national regulation.

Port of Surabaya is very potent to make this happen considering that it is the second biggest port in Indonesia and it belongs to PT Pelindo III, which have a strong influence to the development of the other ports in Indonesia and in particular to other ports under the management of the enterprise.

Whatever the weaknesses of the conditions of Port of Surabaya, it should bear always in mind that the local level contingency planning is the basis element of the national contingency planning, and eventually international contingency planning.

It should be local in scope but international in standard. In this case the port should pay attention to the development of the requirements of international standard.

The worth guides to follow are those recommendations and guidelines published by International Maritime Organisation (IMO), and IMO international convention.
OPRC Convention 1990. Regarding the compensation liability of dangerous goods the new HNS convention has been adopted in May 1996.

To follow the right concept however is not an easy thing. The first thing required to the establishment of reliable preventive and emergency response preparedness is risk analysis.

Port of Surabaya does not have sufficient information to identify the existing hazards.

The port has the responsibility to make this happen. It should have courage to take initiatives for these actions.

So in this case risk analysis should be done. For marine environment protection the knowledge of the marine sensitive areas, such as coral reefs, fishery area, mangroves, and so forth needs to be identified.

This will need an environmental impact assessment. Port of Surabaya has already conducted water quality sampling in 1992. This data alone is far less than enough for a risk analysis purpose.

An action plan to be done in order to enable this to be carried out with minimum cost and maximum benefits. The principle in the action plan is to work and share together burden and advantages among the interested parties, as follows.

The first step is to identify the information needed, then formulate them into objectives.
The second step is to identify the organisations which likely capable and have the same interest in doing the EIA.

The possible organizations to be approached is the Research and Development Agency of Ministry of Communications, the Ministry of Environment, the Directorate General of Fishery, Municipal Environmental Impact Agency, Directorate Oceanography, Ministry of Industry and Commerce, and Universities.

All of the organisations have some experts which enable the environmental impact assessment to be done with sharing finance and expertise.

The third step is to choose and gathered the representatives of each involved organisation to define the duties and responsibilities, organisational structure, working area, working system, administration, funding arrangement, logistics, reporting procedures, working schedule, and so forth. In short everything should be standardised and well organised.

The next steps are to conduct the job to and to finish it according to the standard agreed.

When the EIA project is finished, the data will be used in the process of planning for the emergency response or contingency planning.

This planning is conducted step by step, again with the cooperative principle.

The basic step is to select and organise a planning team. The planning team will consist of Port Administrator of Surabaya, Director of Port of Surabaya Branch, Mayor of Surabaya City, The city Police chief of Surabaya, Head of the Regional Office of Ministry of Communications, Chief of Environmental Impact
Agency in Surabaya, Head of Fire Brigade Department, Head of City Hospital, Community Group Representative, Industry Representative, Head of Indonesian Shipowner Association in Surabaya, Head of Stevedoring Companies Association in Surabaya, Head of Indonesian Journalist Association in Surabaya.

The team leader will be the Major of Surabaya and the vice team leader will be the Port Administrator of Surabaya.

Planning team will be in the form of a committee and divided into three sub committees.

Each sub committee is chaired by leader and staffed by three or four of the various bodies involved. Membership are alternatives, but in each sub committee there should be representatives from Fire Brigade Department, City Hospital, Regional Environmental Impact Agency. Each will employ permanent administrative staffs.

The first sub committee is the sub committee which reviews the existing plans. The duty of this committee is to prevent the overlap and inconsistency of the plans, provide information and ideas and facilitates the coordination of the plan with other plans. This will be led by the Head of City police Department. Members are alternatives.

The second sub committee is sub committee on Hazard Analysis. This has a duty of conducting hazard identification, vulnerability analysis, and risk analysis. This will be lead by Head of Regional Environmental Impact Agency. Members are alternatives.

The third sub committee will deal with the assessment of preparedness, prevention, and response capabilities. This will identify existing prevention measurers and response capabilities and assess their adequacy. Members are alternatives.
Upon the completion of the job performed, Emergency plan is written out by the committee. This can be a multi-hazard emergency operation plan or a single hazard emergency plan, depending on the needs. The sample of the elements involved in the plan is put in Appendix 11.

At the end plan appraisal and continuing planning will be carried out by the committee in order to make an evaluation and update. This is done by reviewing actual responses, simulation exercise, and regular collection of new data.

In order to counter the immediate finance consequence, a strategy of identifying finance resources should be developed. A team should be formed to execute this duty.

This will consist of representatives from regional office of Environmental Impact Agency, Port Administrator, and Port of Surabaya. This team is to make a project proposal to the Directorate General of Sea Communications, to be considered and forwarded to the Minister of Communications.

The Directorate General of Sea Communications as the Agency responsible to represent the Country in IMO will have to consider the possibility of gaining technical assistance from IMO or through other international sources, such as Global Environmental Fund.
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Keputusan Menteri Perhubungan Nomor: KM 89/OT 002/Phb-85 tentang Susunan Organisasi dan Tata Kerja Kantor Administrator Pelabuhan.


Surat Edaran Administrator Pelabuhan Surabaya No. HK.506/02/02/Adpl.Sba.96 tentang Penanganan Barang Berbahaya Meledak (Explosives) di Pelabuhan Tanjung Perak Surabaya.(Pelabuhan Tanjung Perak Surabaya).

Undang-Undang Republik Indonesia Nomor 21 Tahun 1992 tentang Pelayaran(Republic of Indonesia)


APPENDIX I

Circular of Port Administrator Surabaya No. HK.506/02/02/
Adpl. Sba.96

DEP. TAMBANG PERTINJAUAN
DIR. TAMBANG PERTINJAUAN LIJT
KETOR ADMINISTRATOR PELABUHAN SURABAYA.

SURAT EDAR
No. 4 HK.506/02/02/Adpl.Sba.96

TENTANG
PENGGUNAAN BARANG BERBAKAR: NUDUI MELEDAK (EXPLOSIVES)
DI PELABUHAN TANJUNG PERAK SURABAYA.

1. DASAR
a. Undang-Undang RI tahun 1992 tentang Kepelabuhanan.
b. Peraturan Pengawasan Kapal Tahun 1935 Pasal 1/2
   a/d 157.
d. DDO Gado
e. Aturan-aturan Internasional dan Nasional lainnya
   yang mengatur tentang Barang Berbahaya Nudui Meledak
   (Explosives).

2. Mendirik butir 1 (satu) tersebut diatas, dengan ini diberitahukan kepada:
   - Pemilik Barang;
   - Perusahaan Pelabuhan;
   - Perusahaan Bangkai Karet; BML;
   - Produsen Barang, Nuklora-Nuklora kapal dan semua Instansi yang terkait dengan
     pengenaman barang mulai meledak (explosives) baik dalam pengenaman barang
     borbahaya tersebut harus nonpoisikatkan Lal-lal sebagai berikut:

   a. Setiap barang borbahaya mulai meledak (explosives) harus
      - mengindikasikan nama, tanda yang benar 
      - nomor deskripsi, atau produk = bukan
      - barang yang dicantumkan pada kategori klasifikasi UN nummernya dan competent
      - bilitinyan. Disetujui jenis dan jumlah pelelanganya serta jumlah barat
      - apa bila masuk adik borbahaya sesuatu karena dicantumkan pula
      - sifat borbahaya sesuatu, dan apabila dimasukan dengan tidak nonpoisikat
      - kan kapal khusus karena dikenal luar dan dalam.

   b. Perintah aturan pengendalian barang borbahaya mulai meledak (explosives)
      harus secara truck lossing, tidak boleh ditimbang digulung
      - atau tertarik mengenal didalam pelabuhan. Dimulai oleh awak kapal, pot-
      - yungu ideal (KIP), 123 dan pengawalan dari Polri.
      - Jadi jika clat-clat poran dan potugs dikapal naungan didarat.
      - Lokasi perintah atau pengendalian harus sama; kapal tidak boleh tan-
      - dar atau ditandai; jaraknya sama dengan kapal lain. Setiap kapal
      - bisa oleh gurau tidak tercantum posisi surut; nonpoisikatkan waktu
      - dan wewen; keadaan tidak boleh dilakukan waktu gunan aja potir dan
      - apabila dilesakan pula naung lari harus mendapat ijin dari Administra-
      - tor Pelabuhan.

143
3. Dongker untuk dipertahankan dan pelaksanaannya.

DENAH:

SURABAYA.

P.D.I. TINGG.I : 26 - April 1996

Salinan Surat Berman ini diserahkan kepada:

1. Parc Kopala Bidang Kantor Idal.
   Tg. Perak Surabaya.
3. DPO INI Tanjung Perak Surabaya.
4. DPC IMI Tg. Perak Surabaya.
5. DPO CIKSESI
6. DPO CIKSESI
7. Parc Nakhoda kapal.
### Appendix 3: Specimen of dangerous Goods Classifications according to Joint Decree between Port administrator surabaya and Head of Regional Customs Office VII 1979

<table>
<thead>
<tr>
<th>No.</th>
<th>Nama Barang</th>
<th>Halaman dan Kode IMCO</th>
<th>Sifat</th>
<th>Keterangan</th>
</tr>
</thead>
<tbody>
<tr>
<td>89</td>
<td>Alloys of Alkaline Earth Metal non-pyrophoric, n.o.s</td>
<td>4141</td>
<td>Bahan padat yang karen na air/uap air menimbulkan gas mudah menyala.</td>
<td>II</td>
</tr>
<tr>
<td>90</td>
<td>Allyl Alcohol (i,f,g)</td>
<td>3055</td>
<td>Cairan mudah menyala.</td>
<td>II</td>
</tr>
<tr>
<td>91</td>
<td>Allyl Aldehyde (i,f,g)</td>
<td>3021</td>
<td>- s.d.a -</td>
<td>II</td>
</tr>
<tr>
<td>92</td>
<td>Allyl Bromide (i,f,g)</td>
<td>3055</td>
<td>- s.d.a -</td>
<td>II</td>
</tr>
<tr>
<td>93</td>
<td>Allyl Chloride</td>
<td>3023</td>
<td>- s.d.a -</td>
<td>II</td>
</tr>
<tr>
<td>94</td>
<td>Allyl Chlorocarbonate</td>
<td>8027</td>
<td>Bahan sangat Merusak dan mudah menyala.</td>
<td>II</td>
</tr>
<tr>
<td>95</td>
<td>Allyl Chloroform</td>
<td>8027</td>
<td>- s.d.a -</td>
<td>II</td>
</tr>
<tr>
<td>96</td>
<td>Allyl Iodide</td>
<td>8023</td>
<td>Bahan Perusak.</td>
<td>III</td>
</tr>
<tr>
<td>97</td>
<td>Allyl Trichlorosilane Stabilised</td>
<td>8029</td>
<td>Bahan merusak dan mudah menyala.</td>
<td>II</td>
</tr>
<tr>
<td>98</td>
<td>Aluminium Powder (coated)</td>
<td>4021</td>
<td>Bahan Padat mudah menyala.</td>
<td>II</td>
</tr>
<tr>
<td>99</td>
<td>Aluminium Powder (coated, non-pyrophoric)</td>
<td>4042</td>
<td>Bahan Padat yang karen na air/uap menimbulkan gas mudah menyala.</td>
<td>II</td>
</tr>
<tr>
<td>100</td>
<td>Aluminium Powder (Pyrophoric)</td>
<td>4119</td>
<td>Bahan Padat yang mudah menyala.</td>
<td>II</td>
</tr>
<tr>
<td>101</td>
<td>Aluminium, alloys or metal (bearings chips, granules shaftings, umpolis head powder)</td>
<td>4074</td>
<td>Bahan Padat yang karen a air/uap menimbulkan gas mudah menyala.</td>
<td>II</td>
</tr>
<tr>
<td>102</td>
<td>Aluminium Alkilchloride</td>
<td>4075</td>
<td>Bahan mudah menyala sendiri.</td>
<td>II</td>
</tr>
</tbody>
</table>

**Keterangan**

I. Dibongkar Langsung keluar atau disimpan sementara di tongkang khusus.
II. Dibongkar langsung keluar atau disimpan di gudang api.
III. Dibongkar langsung keluar atau disimpan di gudang khusus.
Appendix 4 : A Form of Permit for Handling of dangerous Goods in Port of Surabaya

DEPARTEMEN PERHUBUNGAN
DIREKTORAT JENDERAL PERHUBUNGAN LAUT
KANTOR WILAYAH IV
KESYAHBANDARAN SURABAYA

Formula: 1b

Surat Kepurusan Syahbandar Surabaya
Surat ijin Membongkar

Tanggal : ........................................
Nomor : ........................................

SYAHBANDAR SURABAYA

Membaca : Surat permohonan kelonggaran membongkar barang-barang berbahaya kepada Syahbandar Surabaya dari : .......................................................... tanggal ..........................................................
No. .................................................................................................................. untuk membongkar barang-barang berbahaya ..........................................................

Menimbang : Pentingnya barang-barang tersebut di Surabaya

Mengingat : 1. Pasal ...........................................................
2. Pasal ...........................................................

MEMUTUSKAN

Menetapkan :

PERTAMA : Memberi kelonggaran membongkar barang-barang tersebut di atas kepada KM. : ........................................
isikotor : ........................................ bertanda selar ........................................ bendera : ........................................
Nama nakhoda ..........................................................

Untuk satu kali di Surabaya.

KEDUA : Dengan syarat-syarat sebagai berikut :
1. Harus diadakan ventilasi yang cukup
2. Di atas kapal harus tersedia alat-alat pemadam kebakaran yang sewaktu-waktu dapat digunakan dengan bebas
3. Dilarang mengadakan api yang terbuka atau menerbitkan bunga api dengan jarak 5 meter dari barang-barang tersebut
4. Diwaktu membaongkar barang-barang tersebut harus diangkut dengan hati-hati dan jangan sampai pecah dan bersentuhan satu sama lain
5. Tidak boleh membongkar didelkat barang-barang yang mudah menangis dan yang terbakar sendiri
6. Selama membongkar kapal harus siap sedia untuk setiap saat bilaman perlu meninggalkan jembatan
7. Dilarang membongkar setelah matahari terbenam
8. Selama membongkar harus disiapkan unit PMK kelas B atau C didelkat kapal dan diawasi oleh petugas dari Kesyahbandaran Surabaya
9. Supaya memberikan pengamanan yang baik

KETIGA

Kembali Kepada Yth,
Nakhoda/Juragan tersebut

Tembusan disampaikan kepada Yth,

PT. Pelayaran :
Kadit. Perkapalan & Pelayaran DIPL di Jakarta
Kakanwil Hubla IV Surabaya.
### Appendix 7  Result of Water Quality Sampling

<table>
<thead>
<tr>
<th>Parameter Yang Dinamis</th>
<th>Parameter</th>
<th>Unit</th>
<th>Klaster W1</th>
<th>Klaster W2</th>
<th>Klaster W3</th>
<th>Klaster W4</th>
<th>Klaster W5</th>
<th>Klaster W6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Temperatur</td>
<td>oC</td>
<td></td>
<td>30.0</td>
<td>31.0</td>
<td>31.0</td>
<td>32.0</td>
<td>32.0</td>
<td>30.0</td>
</tr>
<tr>
<td>2. Total Dissolved Solid (TDS)</td>
<td>mg/L</td>
<td>3041.2 +</td>
<td>3500.0 +</td>
<td>2400.0 +</td>
<td>6750.0 +</td>
<td>6015.0 +</td>
<td>5622.0 +</td>
<td>3633.0 +</td>
</tr>
<tr>
<td>3. Padatan Terasperia</td>
<td>mg/L</td>
<td>48.00</td>
<td>58.00</td>
<td>54.00</td>
<td>50.00</td>
<td>68.00</td>
<td>50.00</td>
<td>50.00</td>
</tr>
<tr>
<td>4. Zat Yang Tersapu</td>
<td>mg/L</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table Notes:**
- W1: External
- W2: Kanal
- W3: Terminal Perumahan
- W4: Ane Intensif
- W5: Tandu Terasperia
- W6: Muara Kali LAMONG

ANDAL Pengembangan Pelabuhan Tanjung Perak
STUDI EVALUASI LINGKUNGAN
PELABUHAN TANJUNG PERAK
SURABAYA

Keterangan:
-·- Wilayah Kerja
Pelabuhan T.Perak
-·- Wilayah Kepentingan
Pelabuhan T.Perak

LOKASI SAMPLING
UNTUK pH.

Gambar 11-5
Wilayah Kerja dan
Kepentingan Pelabuhan
Tanjung Perak, Surabaya

Skala 1 : 100,000

Jalan ke Timur
Kota Surabaya

PT PERSEO) PELABUHAN INDONESIA IM
CABANG TANJUNG PERAK
SURABAYA
Sumber: Jannhros Th-A, 1963
Appendix 10 Proposed Command Structure

Legend: --- = coordination
         ____ = direct command
Appendix 11 Sample of Elements in an Emergency Plan

A. Introduction

1. Incident Information Summary
2. Promulgation Document
3. Legal Authority and Responsibility for Responding
4. Table of Contents
5. Abbreviations and Definitions
6. Assumption /Planning Factors
7. Concept of Operations
   a. Governing Principles
   b. Organisational Roles and Responsibilities
   c. Relationship to other Plans.
8. Instructions on Plan Use
   a. Purpose
   b. Plan Distribution
9. Record of Amendments

B. Emergency Assistance Telephone Roster

C. Response Functions

1. Initial Notification of Response Agencies
2. Direction and Control
3. Communications (among Responders)
4. Warning Systems and Emergency Public Notifications
5. Public Information/Community Relations
6. Resource Management
7. Health and Medical Services
8. Response Personnel Safety
9. Personal Protection of Citizens
   a. Indoor Protection
   b. Evacuation Procedures
   c. Other Public Protection Strategies
10. Fire and Rescue
11. Law Enforcement
12. Ongoing Incident Assessment
13. Human Services
14. Public Works
15. Others
D. Containment and Clean up

1. Techniques for Spill Containment and Clean up
2. Resources for Clean up and Disposal

E. Documentation and Investigative Follow-up

F. Procedures for Testing and Updating Plan

1. Testing the Plan
2. Updating the Plan

G. Hazards Analysis (Summary)

H. References

1. Laboratory, Consultant, and Other Technical Support Resources
2. Technical Library.
### Appendix 12: Methods of Dredging and the Comparative Advantages

<table>
<thead>
<tr>
<th>TYPE OF DREDGE</th>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
</tr>
</thead>
</table>
| **Mechanical dredges** | - can be used in deep water  
- can be used in areas with obstruction and debris  
- excavate at nearly in situ densities, reduced volume of material to be eliminated | - modest production capacity (<400 m³/h)  
- storage systems are separate  
- causes turbidity and sediment resuspension  
- ineffective on free liquids or un-adsorbed pollutants. |
| **Barge - mounted hydraulic** | - good production capacity (up to 1000 m³/h)  
- pipeline directly to the disposal/ treatment area | unable to be used in rough seas  
dredged material contains 80 - 90% water  
- anchoring cables and pipelines present temporary obstructions in navigable channel  
cutterheads and suction lines can be damaged by underwater debris or rock, etc. |
| **Hopper dredges** | - self propelled  
- able to store up to 6,000 m³  
- can be used in rough seas with strong currents  
- no anchoring necessary | difficult to use in shallow areas  
- unable to work continuously, must be emptied  
- less precision |
| **Pneumatic dredges** | - crane supported, can be used on shore or mounted on barges or other vessels.  
- used in deep or shallow areas  
- easily transported  
- yield denser slurries than conventional hydraulic dredges  
- cause little turbidity or sediment resuspension | low production rate (300 m³/h)  
cables and pipelines cause temporary obstructions in navigable channels. |
| **Hand-held devices** | - extremely mobile  
- very precise  
- effective for removing pure contaminants | limited to small jobs  
in-effective on consolidated sediment  
- may become plugged by debris |

(Source: Kantin, R, 1989)