LOCAL CONTINGENCY PLAN FOR OIL SPILL MITIGATION AT SEA: A NECESSARY DOCUMENT THAT SHOULD BE PROVIDED TO COMBAT AN EMERGENCY

by
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I. INTRODUCTION

The marine and or coastal environment includes its natural resources which are utilized for national development and increasing prosperity/national welfare for the Indonesian people has been clearly understood. It is necessary to be well managed in view of the 3 kinds of important and unique ecosystems which are interdependent and inter related to each other. Those marine ecosystems are as follows:

1. Mangrove ecosystems,
2. Coral reef ecosystems,
3. Sea-grass ecosystems.

If one of those ecosystems degraded caused by pollution or other relevant reasons, it will decrease the carrying capacity and at last the declining productivity will prevail. This means that the degraded ecosystem will cause the imbalance in other ecosystem(s) and may contribute the outbreak of the declining productivity. Several anthropogenic activities in lands may result the impacts against one of those ecosystems stated above through the drainage system e.g. industrial effluents which do not agree with the quality standard, illegal logging, non environmental oriented development of housing complex, exchange of drainage pattern perfunctorily resulting flooding everywhere, the disposal of solid wastes/ garbage which is not well managed, and others. On the other hand the careless anthropogenic at sea/ coastal zone may also contribute the outbreak of the marine pollution as a result. Oil and Gas activities at sea is one of so many activities which have the environmental risks though they have been compulsory to provide the Standard Operating Procedure (SOP) particularly in self combating spill limited for their working areas.

In this case the oil spill at sea which is in a huge volume of oil and happened in a sudden usually called as a disaster. The disaster which may come from one of the causal factors are among others: blow out from offshore oil-well(s), oil spill from tanker collision or grounded, disposal of dirty ballast from the vessel of which the captain breaks the ratified International Conventions, and explosion of storage tank(s) at the coastal zone.

All type of oil spill at sea will give the negative impacts to the most sensitive locations. Such of those are locations in which the biota communities are still in a succession stage, or the certain locations in terms of economical potency and or natural resources and all at once facing the pollution risks, since such locations are relatively close to the oil & gas operational activities, for example:

a. Ponds/fish ponds (*tambaks*) or tourist resorts or mangrove forests or seaweed aqua-cultures which are relatively close to the navigational tanker route.
b. Protected (preservation/conservation) areas of which the positions are relatively close to the oil & gas operational activities.

Several short notes are presented in this paper to obtain the illustration of the spill at sea.The accident of TORREY CANYON happened in March 1967 spilled the Kuwait crude as much as 118.000 tons in the vicinity of Santa Barbara. But the larger spill in the world derived from the ship AMOCO CADIZ happened in 1978 polluted the English-channel. Eight years later the disaster was happened again where several storage tanks exploded and caught on fire resulting 8 million litres of crude oil spilled out and polluted the coastal zone of the Panama Bay.

In 1996 a tanker was grounded and trapped in the snowy/icy seawater and stormy of the Alaskan Sea where the oil spill was very difficult to mitigate in such condition.

In Asian region there was a VLCC KANCHENJUNGA (± 270.000 DWT) grounded on

LEMIGAS SCIENTIFIC CONTRIBUTIONS
VOL. 29. NO. 2, AUGUST 2006: 24 - 33

the coral reef off Jeddah harbour on 21st of April 1989 where 25.000 bbl of Basra crude oil spilled into the sea (Red Sea). Then the super tanker DIAMOND GRACE (± 259.999 DWT) which carried the cargo of crude oil from Arab Emirates (UAE) as much as 257.000 tons, on 2nd of July 1997 was grounded on the coral reefs in the vicinity of Tokyo Bay, Japan where 13.400 tons crude oil spilled into the sea. The spillage was spread very rapidly and reached up to 20 Km from the central point of the spill during 48 hours (Media Indonesia News, July 3, 1997), and it was very difficult to localized the oil using oil-booms because of the rough sea and smoggy condition.

How is the sea pollution in Indonesian waters?

It is still fresh in mind that the first vessel accident happened in Indonesia was the grounded of super tanker SHOWA MARU (± 237.698 DWT). The accident happened on the 6th of January 1975 during her navigational passage from The Gulf to Japan and grounded at Singapore Strait (± 3 Nautical Miles away from Sebarok Island) where ± 800.000 gallons of crude spilled into the sea and polluted the coastal zone of Riau Islands. Then the 'small' spill was happened in the middle of October 1982 where the oil lumps polluted the coastal zone including the *tambaks* area in the vicinity of Muara Bungin (Tanjung Karawang). Presumably the pollutant derived from the disposal of dirty ballast or slop tanks of the tanker. Other accident was also happened where the M.V. TIPISON (± 9.000 DWT) carried the cargo of woods was sunk near Gresik harbour on the 8th of August 1983 caused by collision with other vessel and resulting 330 tons of MDO (Marine Diesel Oil) and 246 tons of MFO (Marine Fuel Oil) spilled into the sea.

The Greek vessel MONEMVASIA (± 128.366 DWT) in October 1983 was scratched by the remains of a sunken ship at north of Bintan Island resulting some of her containers were torn and ± 4.000 tons of crude oil was spilled into the sea.

The other accident was also happened again caused by the grounded of the vessel KING FISHER in 2000 where the spill of crude from the Middle East polluted the coastal zone of Cilacap (southern coast of Central Java Province) covering some Km long. Other report stated several fish-ponds within the area of Indramayu coastal zone (West Java) were polluted by oil lumps in 2001. Meanwhile the sandy beaches of Pramuka Island and Pabelokan Island were polluted by tar-balls in 2004. The last report informed that the oil spill appeared in the northern part of Kepulauan Seribu (Jakarta Bay) on the 20th of February 2006.

Though the inventory of tanker accidents and the spill in Indonesia did not give the complete information, but the serious impacts of pollution caused by the oil-spill are not limited to be suffered by physical and biological environment but also give the appearance of impacts to the other aspects which are connected with the human life e.g. socio-economical and cultural aspects of the impacted coastal community for the certain time period if it is not mitigated properly.

To protect the sensitive areas as stated earlier and or to minimize the degraded natural resources caused by the oil spill at sea, it is necessary to provide or make the arrangement of specified, aimed and integrated document on the Local Action Plan/ Local Contingency Plan. Careful planning is an essential for any successful operation, especially an emergency one.

According to UNEP (1983) it is stated that the main objective of the Action Plan is: " ..... *protection of the marine environment and the coastal areas for the promotion of the health and well-being of present and future generation(s), and to provide a framework for an environmentally sound and comprehensive approach to coastal area development particularly appropriate to the needs of the region ..... achieving the management of those marine environmental quality or on the protection and use of renewable marine resources on a sustainable basis.*"

Hopefully the Local Contingency Plan Document shall support and complete the *National Contingency Plan*. It seems that the Indonesian Presidential Regulation regarding on the National Contingency Plan (NCP) has not established yet up to now. Meanwhile the coastal areas of several Provincial Authorities in Indonesia seems to be facing the risks of oil pollution at sea from time to time and unfortunately most of them have a limited knowledge to anticipate and to mitigate the marine pollution by oil. Even though the Indonesian Environment Act No. 23/1997 and the Act of Local Authority No. 32/2004 stated that the Local Governments have the authority to control the environment in accordance with their capacity and the needs of each of the local Government, including to

LEMIGAS SCIENTIFIC CONTRIBUTIONS
VOL. 29. NO. 2, AUGUST 2006: 24 - 33

control marine pollution and the act damaging the marine environment in the certain limits of authority.

The aim of this paper is to obtain some positive responses from the local government level (Provincials) which having the risks of oil pollution to provide the LCP document, since they are close to the oil and gas operational activities or facing the tanker's lane.

II. CLASSIFICATION OF OIL SPILL

The spillage of oil may be classified based on its extent of spill and should follow the tiered response concept from ITOPF (2006), which basically are defined as follows:

Tier 1. Most oil spills are small and can be dealt with locally.

Tier 2. Should the incident prove beyond the local capability or affect a larger area, an enhanced but compatible response will be required.

Tier 1 and Tier 2 may form part of a larger district or national plan, which may in turn be integrated into regional response arrangements covering two or more countries (Tier 3).

The above tiered response concept has been accommodated suitable for the Indonesian atmosphere and classified in detail as follows:

Tier 1.: Is the categorization of the emergency oil spill mitigation in the or out of the working area of an harbour and the precinct of Port Administrator authority or in the vicinity of oil and gas exertion or other activities which can be dealt with local facility (tools, equipments, chemicals), infrastructure and personnel provided by them in which the Port Administrator nearby shall be designated as Mission Coordinator.

Tier 2.: Is the categorization of the emergency oil spill mitigation in the or out of the working area of an harbour and the precinct of Port Administrator Authority or in the vicinity of Oil & Gas exertion or other activities which cannot be dealt with local facility (tools, equipments, chemicals), infrastructure and personnel provided by them based on the level tier 1, in which the Coordinator of Port Administrators shall be designated as Mission Coordinator.

Tier 3.: Is the categorization of the emergency oil spill mitigation in the or out of the working area of an harbour and the precinct of Port Administrator Authority or in the vicinity of Oil & Gas exertion or other activities which cannot be dealt with the facility, infrastructure and personnel provided by them in a larger areas or national region based on the level tier 2, or the spill spreads across the frontier between two or more countries, in which the Director General for Sea Communication shall be designated as Mission Coordinator.

The tiers response concept of Tier 1 was usually happened in Indonesia. But the concept of Tier 2, can be hopefully implemented based on Local Contingency Plan (LCP). Unless if the incidents happened just near the frontier of Indonesian territory with other countries and cannot be dealt with the facilities and personnel based on the level tier 2, so the National Contingency Plan (NCP) will be put into effect. It will be more benefits for several Local Governments to carry out the arrangement of the LCP while waiting for the approval of the NCP by the President. As an example, the Board for Environmental Management of Jakarta Special Capitol Area (BPLHD-DKI) is now trying to complete the arrangement of the LCP in view of the frequent of marine pollution by oil in Jakarta Bay.

III. LOAD ON TOP (LOT) OPERATION OF THE SHIP: AN OVERVIEW

Most crude oils contain wax and other materials in solution, together with sediments, which may settle out during the voyage and form a residue or sludge with any cargo remaining after discharge. If discharged into the sea in heavy concentrations in the course of tank washing the residue will stay on the seawater surface for a long time and cause pollution.

The main principle in the technical guidance (1973) clearly states that all dirty ballast and tank washing must be kept on board and may be discharged at loading terminals where the necessary facilities are available. If not, the residue must be retained and new cargo loaded on top. Then, from this tecnical guidance it is pointed out that in no circumstances may the residue be discharged into the sea unless the safety of the ship or its personnel is at hazard.

LEMIGAS SCIENTIFIC CONTRIBUTIONS
VOL. 29. NO. 2, AUGUST 2006: 24 - 33

The essential purpose of the *Load on Top* system is the collection and settling on board of the water and oil mixtures resulting from ballasting and tank operations (including from the slop tank(s)) and their subsequent disposal ashore at the discharge port.

Some of physical properties of Oil should be understood in obtaining the behaviour of the spill. When oil and water are agitated together, droplets of oil can enter the water phase and reversed process occur at the same time. If several drops of oil enter the water phase, they are generally well dispersed. The force of dispersion is strong enough to all directions horizontally untill reaches the ballance of the two surface tensions between oil phase and water phase, characterized by the appearance of oil film on the seawater surface. The rate depending upon the Specific gravity (S.g.) of the oil.

The variation of average film thickness with time of spreading can be estimated and may be derived from the simple mathematical expression according to Blokker (1964) as follows:

$$h_t = \left(\frac{V}{\pi}\right)^{1/3} * \left(\frac{Sw}{3.S_o\,(S_w - So)\,K_r\,t}\right)^{2/3}$$

where ht = average film thickness (cm) at time t
t = time of spreading (second)
V = volume of oil spilt (cm^3)
S_w = density of water (gr/cm^3)
So = density of oil or Specific gravity (gr/cm^3)
Kr = constant for a given oil.

As an example, the calculated average thickness of the oil films resulting from spillages of 100 m^3 of certain crude oils are given in Table 1.

The 1969 amendments of the Convention impose a *total prohibition* on the discharge of any oil or oily mixture from a tanker within 50 miles of any coast, and limit the flow of ballast discharge, concentration and the quantity discharged anywhere else at sea. Limited discharges may be made when the following conditions are satisfied among others:

(1). The tanker is proceeding en route.

(2). The instantaneous *rate* of discharge of oil content of any effluent from the ship shall not exceed 60 litres per mile. The simple equation used to meet the criterion is as follows:

$$\frac{(ppm\ oil\ content\ in\ the\ effluent)\,x\,(rate\ of\ discharge\ in\ m^3/hour)}{(the\ speed\ of\ the\ tanker\ in\ knot)\,x\,1.000}$$

According to the 1969 Convention the permitted oil content maximum was 100 ppm. But in the 1990 amendment stated the maximum content of oil was changed from 100 ppm to no more than 15 ppm considering the development of technolgical equipments provided.

(3). The total quantity of oil discharged on a *ballast voyage* does not exceed 1/15.000 of the total cargo-carrying capacity.

(4). The tanker position is more than 50 miles from the nearest land

When a tanker is within 50 miles of land the only permitted discharge is clean ballast from a cargo tank which has been so cleaned that the effluent therefrom would produce no visible traces of oil on the surface of the seawater.

There are several factors influencing the basic LOT operation method, but in this paper the writer makes an overview on only one causal factor viz coastal voyages.

Tabel 1
Average thickness of oil slicks derived from spillage of 100 m^3 of oil

Crude oil	Constant (Kr)	Average thickness of oil slick (mm)		
		2 minutes	20 minutes	120 minutes
Kuweit	1.48	1,90	0,41	0,12
Iranian heavy	750	2,99	0,64	0,20
Tia Juana medium	1.34	2,33	0,50	0,15

Source: Anonim (1974)

LEMIGAS SCIENTIFIC CONTRIBUTIONS
VOL. 29. NO. 2, AUGUST 2006: 24 - 33

If we pay attention to the International Convention products mostly based on the western thinking pattern which refers to the European and American countries which are not in the form of an archipelagic state. Additionally their continental shelf as the Economically Exclusive Zone is not extensive as in the Indonesian country. So the 50 miles criterion has been considered as to be save for their coastal zone. On the other hand based on the considerations that Indonesia is an archipelagic state where seas among islands are considered as an *internal sea*, inwhich so many adjacent islands having several activities in the coastal areas, and tend to create certain locations are at marine pollution risks, so the way-out should be formulated to make socio economical of coastal people is going smoothly in a ballance way together with the oil & gas activities including tanker operations.

The Conventions have been ratified by the Indonesian Government, but the prove with facts from the field show the marine pollution by oil spill as well as the ballast discharge is still frequently found.

In the Technical Guidance for Oil Tankers also stated if a tanker's passage between her discharge port and the next loading port is wholly within 50 miles of the coast, no discharge associated with a LOT operation is permitted. Furthermore the Guidance pointed out all dirty ballast and cargo tank washings must be discharged at the loading port if reception facilities are available. The questions are: do we have the receiving facilities provided sufficiently at all loading ports in Indonesia? If the scarcity of such facility is un-true then is there any connection with the captain behaviour to discharge dirty ballast perfunctorily in Indonesian waters? This condition is clearly having the implications that should be overcome properly. It seems the 50 miles criterion should be reconsidered in terms of the application in the archipelagic state with so many adjacent islands like Indonesia. Another clause stated if a LOT operation must be carried out, then the ship must go beyond the 50 miles limit to decant the water from the ballast and slop tanks. The problem will appear in an archipelagic state if beyond 50 miles from loading port but less than 50 miles from other nearest island(s) the discharge is implemented then which one should be chosen to obey the rule? Furthermore the important problem will appear if the discharge of dirty ballast by the careless captain does not consider the intended island(s) which is/are designated as protected areas or as the marine environment with the unique ecosystem as stated earlier is found. This is the different between 50 miles from the loading port in the European/American countries and in the archipelagic state like Indonesia. Then how far is the rule enforcement of the ratified conventions in this country? This is just as subject to be discussed in a higher level.

IV. WHAT ARE THE RELEVANT LEGAL BASIC CONSIDERATIONS?

There are several Acts, Government Regulations and Presidential Decrees as well as Ministerial Decree of which to be the relevant basic considerations in preparing the Local Contingency Plan (LCP) as presented among others:

1. The Act Nr. 5/1990 on the Natural Resources Conservations and Its Ecosystems (Government Official Gazette of the Republic of Indonesia Nr. 49/1990, Government Gazette Supplement Nr. 3419).
2. The Act Nr. 23/1997 on the Environmental Management (Government Official Gazette of the Republic of Indonesia Nr. 68/1997, Government Gazette Supplement Nr. 3699).
3. The Act of Local Authority Nr. 32/2004 (Government Official Gazette of the Republic of Indonesia Nr. 125/2004, Government Gazette Supplement Nr. 4437)
4. Government Regulation Nr. 17/1974 on the Implementation of the Supervision to the Oil and Gas Exploration and Exploitation at Sea (Government Official Gazette of the Republic of Indonesia Nr. 20/1974, Government Gazette Supplement Nr. 3031)
5. Government Regulation Nr. 19/1999 on the Marine Pollution Control and the Act Damaging Marine Environment (Government Official Gazette of the Republic of Indonesia Nr.32/1999, Government Gazette Supplement Nr. 3816).
6. Government Regulation Nr. 69/2001 on the Harbour Affairs (Government Official Gazette of the Republic of Indonesia Nr. 127/2001, Government Gazette Supplement Nr. 4145).
7. Presidential Decree of the Republic of Indonesia Nr. 18/1978 on the Ratification of the International Convention on Civil Liability for Oil Pollution Damage 1969 (Government Official Gazette of the Republic of Indonesia Nr. 28/1978).

LEMIGAS SCIENTIFIC CONTRIBUTIONS
VOL. 29. NO. 2, AUGUST 2006: 24 - 33

8. Presidential Decree of the Republic of Indonesia Nr. 46/1986 on the Ratification to the International Convention for the Prevention of Pollution from Ships, 1973 and the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL 73/78) (Government Official Gazette of the Republic of Indonesia Nr. 59/1986).
9. Presidential Decree of the Republic of Indonesia Nr. 52/1999 on the Ratification to the Protocol of 1992 to Amend the International Convention on Civil Liability for Oil Pollution Damage 1969 (Government Official Gazette of the Republic of Indonesia Nr. 52/1999)
10. Ministerial Decree of the Minister of Environment Nr. 51/2004 on the Seawater Standard Quality for Marine Biota (Appendix III).
11. Other relevant and prevailing Local Government Regulation(s) provided.

Apart of the above legal aspects, the marine oil and gas activities map should also be understood. A mega project of refinery plant will be developed in the near future by an Indonesian private business at Pare-Pare, the western coast of South Sulawesi. The feedstock for the refinery will be a mixture of 80 % Arabian Light and 20 % Arabian Heavy crude. The Ultra Large Cargo Carrier (ULCC) with the capacity of approximately 500.000 DWT may pass through Makassar Strait or transit in Pare-Pare hopefully. While this passage is also being used for other big tankers carrying the crude from the Middle East to Japan but no admittance to pass through Malacca Strait and those ships have to enter the Lombok Strait instead. At the moment a refinery at Balongan (Cirebon) receives the feedstock from the Middle East as the Cilacap refinery does. But at Dumai refinery receives the feedstock from local production areas and Balikpapan. On the other hand the sweet crude from Minas and Duri are sold to Japan.

An agreement between Indonesian and Iranian governments recently (May, 2006) resulted an MoU following the courtesy call of Iranian President Mahmoud Ahmadinejad in Indonesia. The important thing in the agreement is stated that National Iranian Oil-Company (NIOC) is going to invest the shares in developing a refinery in the cooperative work with Elnusa at the coast of Tuban, East Java. The feedstock will use the Iranian crude. Following the Pare-Pare refinery is under completions then no longer two mini refineries will be constructed at Batam Island.

Based on that considerations, it will be more benefits for local governments concerned are necessary to prepare an arrangement of the LCP from now on in the form of Governor Regulation even such regulation may not be a legal norm unless the NCP has been established. The arrangement document may be implemented in a cooperative work with oil and gas companies and the related institutions within the local areas in the framework of combating oil pollution in case of emergency. Lemigas is always prepared in giving the assistance to the needs of local government communities as well as petroleum companies through accredited laboratory analysis and technical services.

V. OBJECTIVE OF THE LCP

a. To protect environmental damage in an emergency action mainly for the 3 kinds of sensitive coastal ecosystems and such locations in term of economical potency and or natural resources but having pollution risks against the negative impacts from marine pollution by oil.
b. To arrange the environmental cost and clean up cost as a reasonable compensation/indemnity.
c. To reduce the detrimental of socio economical and socio cultural values of the impacted people.

VI. METHODOLOGY

LCP should be arranged under the auspices of the Governor Regulation where the Technical Procedure on the Emergency Action to Combat Oil Spill at Sea should be attached as the Appendix of that regulation concerned.

In general the methodology should follow and consist of several steps as presented below:

1. Organizing and setting up the coordination system among local government bodies and its related institutions. It will be better to make the involvement of local community role.
2. Determining communication and transportation systems that will be used for combating the spill.
3. Inventory on the tools, equipments and chemical materials (Oil Spill Dispersant/OSD) provided by those institutions or stake holders within the local

region concerned that will be used for mitigating the spill including mob and demob. On the other side from the local community may be involved to prepare and to provide the simple equipments to protect their properties against the spread of the spill in the coastal areas such as: bags contained sand from the local beach to protect oil entering *tambaks,* simple boom or natural material (biomass) that will be used as an adsorbent easily/locally provided e.g. coconut fibres or husk, wood shavings, avian feathers and others.

4. Arrangement of GIS (Geographical Information System) zone-map on the coastal zone from satellite-imagery as well as the results of field surveillance to complete with several recent information/data on environment particularly based on the environmental sensitivity index including its digital data in the form of CD-Rom. The photograph of Landsat TM 5 can also be used as a tool for that matter. It is very beneficial if the computer fixed with the special program to obtain the track of the oil spreading versus time based on sea-currents and prevailing winds.
5. Determining on the location(s) that will be protected soon at the time of accident based on priority level with the reference to the environmental information from point 4.
6. To set up the monitoring system as a routine job (e.g. once a month) within the area of petroleum activities include in the vicinity of tanker route near by. The parameters of seawater analysed should be compared to the Standard Quality of Seawater for Marine Biota according to the Ministerial Decree of Minister of Environment Nr. 51/2004 (Appendix III) and or the prevailing local Government Regulation. Observation on marine plankton should also be examined to detect the marine water quality from biological aspect. An evaluation will be made at least on every 3 months basis.
7. To set up the reporting system from the local community as well as from the government official who becoming the first witness at the very beginning of recognition of the spill. Anyway this official should be able to take the oil sample sufficiently and send to the accredited and relevant laboratory without delay. Samples of the pollutant (floating oils, oil lumps, tar-balls) from the field to be analysed including by Gas Chromatography examination to obtain the fingerprints/chromatogram of the pollutant. The results will be compared to the properties of reference oil provided to obtain the source of oil.
8. To set up the emergency combat mechanism of oil spill include the determination of using suitable tools, equipments, and the OSD approved by the Directorate General for Oil and Gas, fire fighting procedure on marine vessel, and salvage to vessel's crew.

   One of the important things in combating the spill is to make prediction on the spreading of oil based on oil type, API Gravity, volume of spill and the thickness of oil at sea as pointed out by ITOPF (2006) and Exxon (1994). It is necessary to be conducted for the determining on the type, quantity, dosage and type of spraying of the dispersant to be applied.

   In this mechanism includes the determination on the clean-up procedure for several coastal types and polluted debris collection and its treatment. The involved personnel in this activity should be equipped with safety work (marine safety).

   To understand a part of the mechanism, one should follow the chart diagram as presented in figure 1. From experience showed that the clean up of remaining oil droplets after spraying the dispersant, the hydrocarbons will be metabolised later by the community of marine microbes naturally. Figure 2 represents the workboat application on the spraying of the dispersant against the spill at sea. The mechanism of the dispersant to disperse the oil can be seen at the schematic diagram below. So far it is acknowledged that the research of using microbes for combating the spill at sea is still limited, but the utilization for the treatment of oily effluents in activated sludge is commonly used. The ceased of emergency combat will be declared by Commander on Scene who designated based on tier concept.
9. The arrangement on *environment cost* and *clean up cost* to estimate a sum of feasible, reliable and reasonable compensation/indemnity.
10. To set up the recovery effort and the existed cost. It might be needed to restore the coast from degradation and or to replace the dead plants (mangroves) by re-greening.
11. To set up the monitoring program after the acci

LEMIGAS SCIENTIFIC CONTRIBUTIONS
VOL. 29. NO. 2, AUGUST 2006: 24 - 33

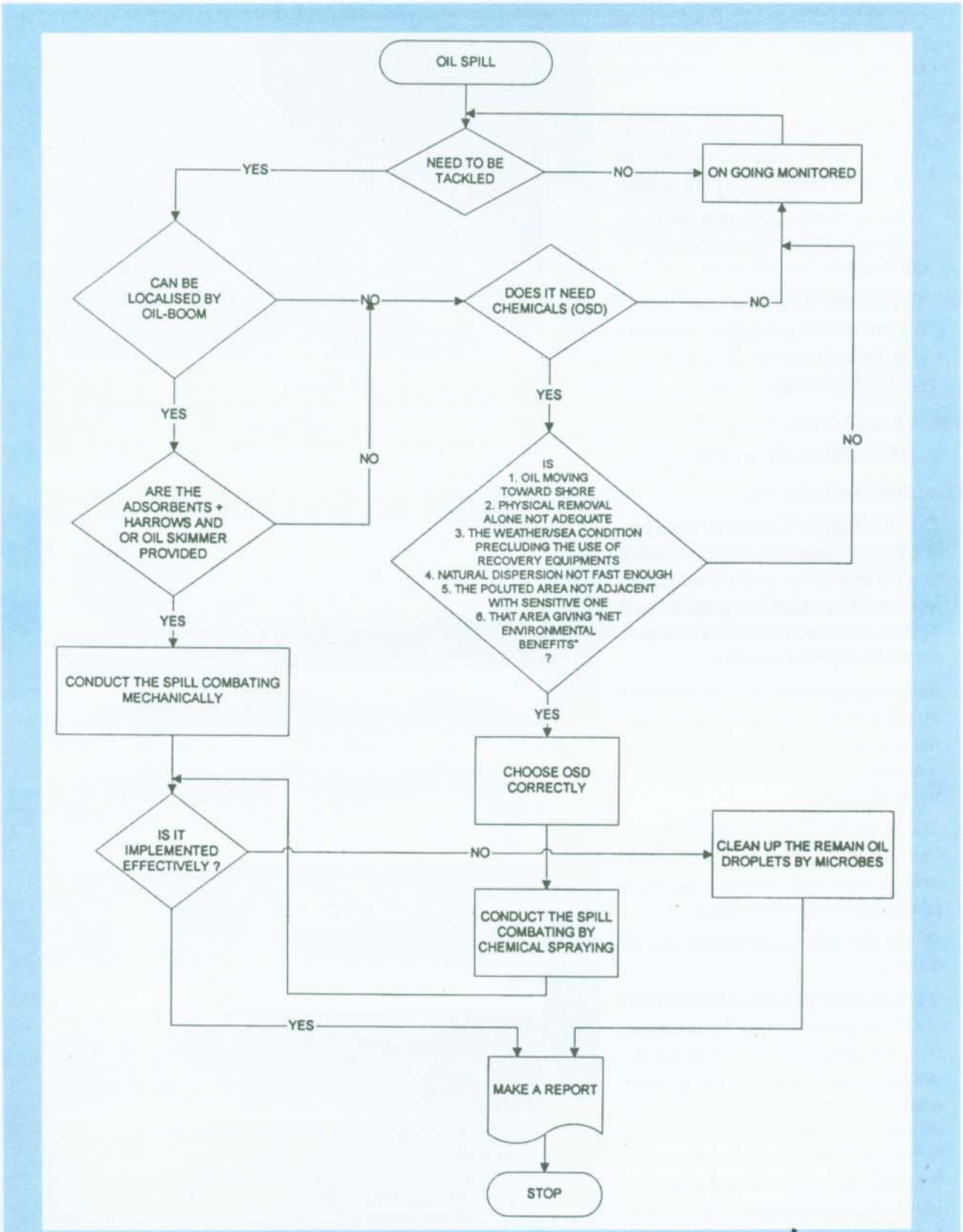


Figure 1
Flow chart of oil clean up

LEMIGAS SCIENTIFIC CONTRIBUTIONS
VOL. 29. NO. 2, AUGUST 2006: 24 - 33

dent just for the certain limit of time period at least 3 months basis to obtain the trend of environmental condition.

12. To make an evaluation on environmental quality after the monitoring program on point 11 has been ceased.
13. To set up the training program to increase the capability of the involved officials..
14. To plan the budgeting cost for routine monitoring program, recovery cost, limited monitoring on post accident and training program.

VII. CONCLUSIONS & RECOMMENDATIONS

This paper concludes that:

a. Considering the increase of development in the near future at the coastal zone in Indonesia, the sensitive areas in terms of economical potency and or the natural resources should be protected from pollution risks.
b. Receiving facilities should be provided by old and new refineries as unloading ports to minimize the dirty ballast discharged by the tanker's captain in the internal sea.
c. The 50 miles criterion needs to be reconsidered if it is applied in an archipelagic state with so many adjacent islands and protected habitats in it.

While the recommendations are as follows:

a. It is suggested that Local Action Plan (LCP) is necessary to be arranged for local government level in the cooperative work among local government bodies and its related institutions, oil and gas companies including stakeholders within the provincial areas in the form of Governor Regulation. The involvement of research institute like Lemigas c.q. Environment Group will be appreciated.
b. It is recommended that the ratified

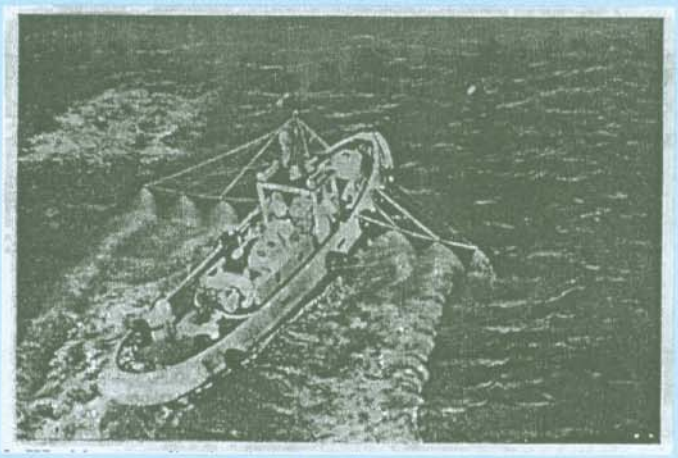
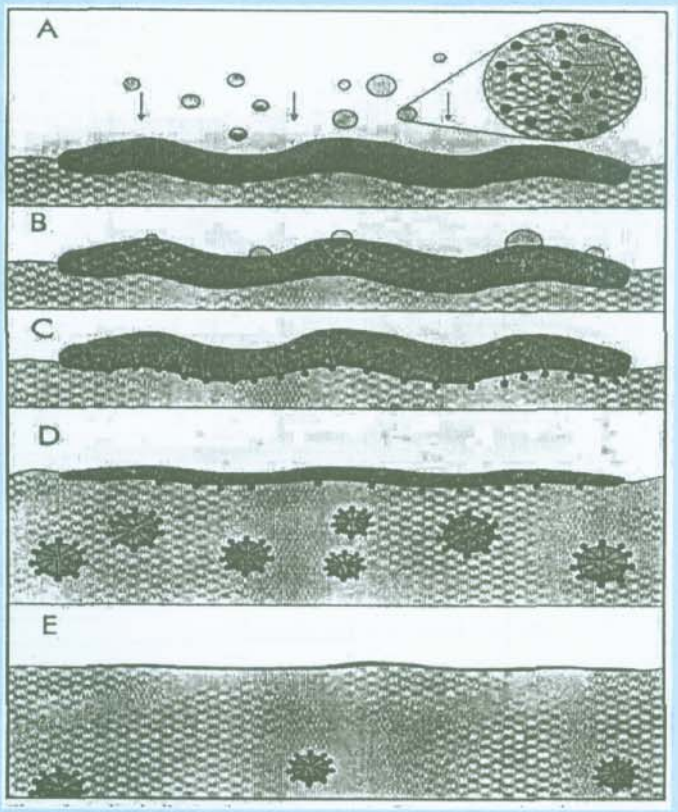


Figure 2
Workboat application is in operation by spraying the OSD on to the spill



The chemical dipersion process. A: Dipersant droplets containing surfactants are sprayed on to the Oil, B: The solvent carries the surfactant into the oil, C. The surfactant molecules migrate to the oil/water interface and reduce surface tension, allowing D: Small oil droplets to break away from the slick, E: The droplets disperse by turbulent mixing, leaving only shenn on the water surface (ITOPF, 2006)

International Conventions and technical regulation for LOT operation including the Indonesian regulations on Environment should be more enforced.

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