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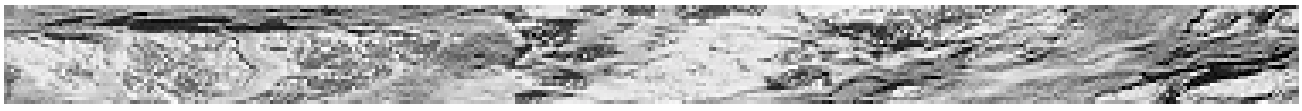
Marine Pollution Management in the Malacca/Singapore Straits: Lessons Learned



March 1998

MARINE POLLUTION MANAGEMENT IN THE MALACCA/SINGAPORE STRAITS: LESSONS LEARNED

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MISSION STATEMENT

The primary objective of the Global Environment Facility/United Nations Development Programme/International Maritime Organization Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas is to support the efforts of the eleven (11) participating governments in the East Asian region to prevent and manage marine pollution at the national and subregional levels on a long-term and self-reliant basis. The 11 participating countries are: Brunei Darussalam, Cambodia, Democratic People's Republic of Korea, Indonesia, Malaysia, People's Republic of China, Republic of the Philippines, Republic of Korea, Singapore, Thailand and Vietnam. It is the Programme's vision that, through the concerted efforts of stakeholders to collectively address marine pollution arising from both land- and sea-based sources, adverse impacts of marine pollution can be prevented or minimized without compromising desired economic development.

The Programme framework is built upon innovative and effective schemes for marine pollution management, technical assistance in strategic maritime sectors of the region, and the identification and promotion of capability-building and investment opportunities for public agencies and the private sector. Specific Programme strategies are:

- Develop and demonstrate workable models on marine pollution reduction/prevention and risk management;
- Assist countries in developing the necessary legislation and technical capability to implement international conventions related to marine pollution;
- Strengthen institutional capacity to manage marine and coastal areas;
- Develop a regional network of stations for marine pollution monitoring;
- Promote public awareness on and participation in the prevention and abatement of marine pollution;
- Facilitate standardization and intercalibration of sampling and analytical techniques and environment impact assessment procedures; and
- Promote sustainable financing mechanisms for activities requiring long-term commitments.

The implementation of these strategies and activities will result in appropriate and effective policy, management and technological interventions at local, national and regional levels, contributing to the ultimate goal of reducing marine pollution in both coastal and international waters, over the longer term.

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Regional Programme Manager
GEF/UNDP/IMO Regional Programme
for the Prevention and Management
of Marine Pollution in the East Asian Seas

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The Malacca Straits Demonstration Project is coordinated by Mr. S. Adrian Ross, Senior Programme Officer, GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas.

Executive Summary

There are two primary dimensions of international cooperation in the management of the Straits of Malacca and Singapore. One dimension involves cooperation among the three littoral States. The other involves cooperation between the littoral States and extra-regional user States. Although this study included lessons learned and needs for policy coordination among the three littoral States, it focuses on lessons learned and gaps to be filled through cooperation between the Straits States and the extra-regional user States.

Lessons Learned

The *Evoikos* spill and its aftermath produced some valuable lessons and become a catalyst for conception and implementation of more measures to ensure safety in the Straits.

1. Competent and disciplined crew and masters are the key to accident prevention. Adequate training is necessary but not sufficient qualification. Good character and discipline are equally important.

2. The implementation of the oil spill contingency plan generally went very well because it was well rehearsed, and the staff were dedicated.

3. Singapore's computer modelling system can accurately predict where a spill would come ashore thus enabling protection efforts to be concentrated in those areas.

4. The amount of costs recoverable under international agreements ratified by the Straits States is grossly insufficient to compensate for major spills and the Straits States should ratify the 1992 Protocols to the Civil Liability and Fund Conventions as soon as possible to qualify for sufficient compensation. (Singapore has partially done so, but too late to be in effect for the *Evoikos/Global Orapin* incident.)

5. Sophisticated risk assessment regarding spilled oil in the Malacca Straits will be difficult due to inadequate data and inability to demonstrate cause and effect.

6. Although there is considerable funding for environmental studies in Southeast Asia, much of it goes to redundant data collection and synthesis.

7. Cooperation among the three littoral States has been largely technical in nature and is generally good. The Tripartite Technical Experts Group (TTEG) has been very effective, particularly in dealing with IMO and UNEP. The Revolving Fund has also worked well, although it has yet to be replenished.

8. It has proven difficult to harmonize the standards and regulations for the Malacca Straits due to different legal systems, different stages of economic development, and different priorities among the Straits States.

9. The main problem in implementing management schemes in the Straits is the multiplicity of concerns and the difficulty of finding common ground. Indonesia and Malaysia continue to have more interests in common than either do with Singapore. But Singapore has become more proactive, at least regarding its own waters, since the formation of its Maritime and Port Authority in 1996.

10. It takes a major disaster like the *Evoikos* incident to spur the Straits States to political cooperation and agreement vis-à-vis the maritime powers.

11. Japan has set a precedent for user States by voluntarily contributing to the improvement of the safety of navigation in the Straits.

PROSPECTIVE ACCOMPLISHMENTS

1. The electronic chart display and information system (ECDIS) promises to greatly improve safety of navigation and thereby reduce costs by preventing accidents and resultant pollution, thus lowering insurance rates, and possibly enabling more cargo to be carried by reducing the minimum underkeel clearance. In the Malacca Straits, the electronic navigation chart (ENC) development has only been underway for two years and there have been many improvements and upgrading of standards. The littoral States are very supportive of ENCs, and will bear the initial costs of chart production.

   Singapore has taken the lead and provided an ENC for its waters for demonstration purposes. ENCs are available from the Maritime and Port Authority. Maersk Lines ships are already using it. Japan and the three Straits States are presently undertaking a joint hydrographic survey of the Straits with a deliverable product being a complete ENC for the Straits. Nevertheless, financial and technical assistance will be necessary for some Straits States to ensure that they have the necessary infrastructure and technically trained personnel to implement ECDIS, or the marine electronic highway (MEH) as well as the relevant IMO Conventions.

2. Malaysia ratified MARPOL 73/78 on 28 January 1997. Also, the Minister of Transport announced that Malaysia supports the new ISM Code. These actions should open the way for enhanced cooperation in enforcement with Singapore and Indonesia and in harmonization of laws, standards and regulations.

3. The Maritime Safety Committee of IMO approved the extension of the TSS in the Malacca Straits in 1998.

4. There is a perception in some Straits States that IMO will use the experience of the Malacca Straits to define UNCLOS Article 43 and that it is trying to stay "ahead of the curve" regarding the evolution of a management regime there.

5. A complete radar system for the Straits became operational in 1998 and thus enforcement is greatly enhanced.

OBSTACLES OR ISSUES TO BE RESOLVED

1. The fundamental problem with cooperation in the control of land-based pollutants is that there is no internationally agreed, unifying principle or framework like UNCLOS to foster and guide such cooperation. Regulation of land-based pollutants remains a national responsibility and right. However, international negotiations have produced a framework within the Global Programme of Action for Prevention of Marine Pollution from Land-based Activities.

2. In managing the Straits, Malaysia and Indonesia have much more area and many more internal and external concerns to resolve than Singapore.

3. Singapore strongly supports the concept of the Malacca Straits as 'straits used for international navigation' and wishes to have IMO take the lead and govern the establishment of a management regime for the Straits. While having ratified UNCLOS and recognizing the right of transit passage, Indonesia and Malaysia insist that first and foremost, the Malacca Straits is part of their waters and that they must initiate, authorize and lead the establishment of a management regime.

4. There is a philosophical dilemma between the principles of freedom of navigation, on the one hand, and the principle of polluter pays, on the other. A compromise must be found which enables the latter without eroding the former.

5. Cross-traffic and coastal traffic are major problems for safety of navigation.

6. Another endemic problem is the faulty character of some shipowners and their ship captains.

7. A major concern regarding the establishment of a Fund is its effective use and management, i.e., how can it be ensured that the money will really be used to improve the safety of navigation?

8. Some extra-regional users oppose a fund in principle because it undermines the concept of the Malacca Straits as a 'strait used for international navigation' as defined in the UNCLOS.

9. There are some concerns that Japan's practice of contributing money to assist safety of navigation in the Straits has been ad hoc and reactive, rather than integrated and proactive.

10. Another major concern is that all Straits States may not uniformly and steadfastly enforce the rules regarding safety of navigation. If they do not do so, substandard vessels and/or crews may be attracted to the region and to the more 'friendly' ports, thereby eroding the competitive advantage of the stricter ports.

11. A problem can arise when port authorities turn a blind eye to obvious discrepancies in sludge loads when a ship puts in for repair. In other words, in order to get its business, a port may ignore evidence that a ship dumped some of its sludge in neighbor's waters.

12. The existence of "no man's lands" creates a problem in enforcement. One particular problem area is located between the TSS lanes near the Nipa Islands where ships wait in Indonesian waters to enter Singapore harbor. There are activities going on here, which require greater surveillance and cooperation between Singapore and Indonesia.

13. Under IMO vessel traffic information regulations, mandatory reporting includes specification of cargo, but shippers and governments of maritime powers oppose this provision. There is also an exemption for warships, which may eventually become a hazard to safe navigation.

14. There is a need to clarify the responsibility of the country in whose waters a spill occurs, as well as the liability of a country that pushes or diverts a spill into another country's waters.

15. The competition between Malaysia and Singapore for providing port services may adversely impact cooperation between them on Straits matters.

16. The obstacles for an MEH for the Malacca/Singapore Straits are that:

a) the sale of the charts does not cover the costs of data gathering and production, so, it is unclear who will pay for the initial system start-up as well as its operation and maintenance;

b) the charts will only be as good as the data, and some data are old and unreliable;

c) new competing systems are becoming available, thus, making the choice of technology an issue;

d) there are insufficient electronic charts available, thus, their use is limited;

e) there are important unresolved questions that need to be addressed regarding the liability of the chart suppliers;

f) there is no agreement yet among the three Straits States as to where the command center(s) will be and who will maintain and update the charts, as well as who will distribute, charge and collect for their use;

g) all vessels using the Straits—no matter how small—would need to carry a computer to be part of the system, however, different versions will be made available and the lowest cost-version will be a simple position locator;

h) not all Straits States have the requisite trained manpower to implement an MEH;

i) to implement an MEH for the Malacca Straits, cooperation across-the-board is absolutely essential and this may not be as forthcoming as it should be;

j) exemptions from the system for military vessels could eventually impede the system's effectiveness;

k) the system could possibly be used for nefarious purposes by, e.g., pirates, terrorists, or computer hackers, or for military purposes in the event of hostilities;

l) to make it work, linkages must be formed with other coastal states and regions, but International Hydrographic Organization copyright prevents copying of digital maps.

18. The process of establishing a new regime for safety of navigation needs to be broadened, in terms number of countries and scope. But some user States are not

interested and do not appear to be particularly supportive of expanding the participation of user States.

19. The implications of non-compliance with Article 43 of UNCLOS for transit rights needs to be clarified.

20. The Straits States need to formulate a common policy approach to the user States. This approach should be based on 'necessity', derived from increased congestion and movement of dangerous cargoes; preventative diplomacy in that a major incident could have repercussions for international relations; the precautionary principle; and the user and polluter pays principles. After the initial coordinated approach by the Straits States to the user States, the initiative should be left to the user States.

21. Holding of a high-level policy conference would maintain the momentum and put pressure on policy-makers to address the outstanding issues. It should be more than an informal meeting but not an official intergovernmental meeting. Perhaps the Straits States should jointly serve as conference co-chairs. The objective should be to have the user States come to the conference with a proposed initiative to address the remaining problems in the Straits.

PROPOSALS FOR CONSIDERATION

1. The IMO is already considering and informally discussing the holding of another high-level conference (similar to the 1996 Singapore Conference) between user and Straits States. It is important to bring in all users and this takes time. What needs to be determined is the parameters for such a conference, i.e., its tentative timing, its objectives and its agenda.

2. It may be time to promote a conceptual separation in the transit passage regime between commercial traffic and military traffic, and thus permit enhanced regulation of the former for the purposes of ensuring safety of navigation, without affecting military/government vessels in any way.

3. The Straits States should establish an International Fund for the management of the Malacca Straits which would solicit 'voluntary' contributions from user State's private sector users and international organizations, and which would be used to enhance safety of navigation.

   This could be accomplished by:

   a) expanding the Revolving Fund to US$25 million by persuading all principal users and stakeholders to contribute;

b) proposing, promoting and establishing an international convention on international straits funding modelled after the 1996 Hazardous, Noxious Substances Convention, as proposed by the United Kingdom to the 66th Session of IMO's MSC; and/or

c) introducing maritime dues by asking users to pay for the services rendered to them to ensure safety of navigation in the Straits.

Potential contributors to any Fund should include:

1) direct user States/economies such as Japan, the Republic of Korea, Taiwan, Thailand, China and the United States, as well as the three Straits States;

2) non-State users such as shipowners, charter parties and cargo owners, refiners and electricity companies;

3) interested parties, such as international organizations charged with navigational safety and marine pollution prevention, i.e., IMO, UNEP, UNDP, GEF; and

4) Middle East exporting countries whose oil passes through the Straits, e.g., Saudi Arabia, Kuwait, Iran and the UAE.

4. The Straits States should establish a Straits of Malacca Commission or Authority to receive funds and manage the Straits. The organization could have a three-tiered structure with a governing and policy-making body comprised of the three Straits States, a Council comprised of user States and other contributors and an administrative coordinating body to manage day-to-day affairs. The TTEG might be upgraded to become the governing body of the new organization.

5. All Straits States should (re)establish internal national coordinating authorities on the Straits of Malacca and Singapore to improve internal policy and technical coordination.

6. The Straits States should greatly step up their profile and participation in IMO affairs, e.g., on its Committees, in the Assembly and on its staff. With a concerted diplomatic effort, they may be able to set or influence the agenda and outcome on Straits affairs.

7. The Straits States should ratify all existing international conventions concerning safety of navigation, prevention of marine pollution and compensation, particularly

the 1971 Fund Convention and its 1992 Protocols, the OPRC Convention, the 1996 HNS Convention, and the 1996 Draft Protocol to the London Convention. The Straits States should also ensure that ships flying their flag comply with these international rules and standards.

8. There are many possible legal and technical approaches the Straits States could take to improve navigational safety in the Straits, either by themselves or in combination.

The following is a partial list:

a. arrest and try masters considered negligent;

b. impose penalties on ships which ignore warnings from traffic controllers;

c. strictly enforce the STWC and ISM Code;

d. upgrade the VTS, add sites and improve command centers, install more CCTV;

e. make reporting of vessels mandatory* and deny port privileges/services to vessels which do not comply;

f. require transponders on vessels using the Straits so that their positions became part of the MEH;

g. make pilotage mandatory for tankers over a certain dead weight tonnes;

h. incorporate anti-grounding warnings and radar targets into the MEH;

i. make fixed routing mandatory for very large crude carriers;

j. incorporate the use of photo evidence in the MEH system so that a photograph of a vessel violating the safe navigation scheme could be forwarded to the vessel's next port of call for use as evidence for the Port State to detain the vessel;

k. propose the Malacca Straits for IMO designation as a "special area" under MARPOL 73/78;

l. establish special inshore zones for coastal traffic and precautionary zones for cross-traffic;

**Mandatory reporting came into effect in December 1998 (STRAITREP).*

m. establish a regime in which a vessel not complying with IMO regulations may have its insurance declared null and void; and

9. Strengthen the Port State Control regime so that ships, which do not comply with the international rules and standards, are inspected and their defects corrected before they are allowed to leave port. Also, all Port States in the region should make compliance with the relevant IMO conventions a condition of entry into their port, even for ships from States which are not parties to the IMO conventions or UNCLOS. Port State control will work only if it is implemented on a regional basis.

Now that all three Straits States have become parties to the UNCLOS and MARPOL 73/78, they should increase cooperation with respect to Port State Control to investigate and prosecute illegal discharges from vessels in the Straits as provided in Article 218 of the UNCLOS. Under this provision, if a vessel voluntarily enters the port of one of the three States, the Port State can undertake investigations, and where the evidence so warrants, institute proceedings in respect of illegal discharges by such vessels in the Straits, even though such discharge was in the territorial waters of another State. Even though this power is subject to certain safeguards, it does provide the legal basis for enhanced cooperation among the three Straits States to effectively deal with illegal discharges from vessels in the Straits.

Introduction

Scope of the Study

This study focuses on the lessons learned regarding navigational safety and marine pollution management issues in the Straits of Malacca and Singapore[1] as well as the cooperation and collaboration between the Straits States—Indonesia, Malaysia and Singapore—in dealing with such issues. In so doing, this study is intended to support the enhancement of environmental management programs in the Straits and assist with the transfer of good practices and experiences to other subregional sea areas in the East Asian region.

This paper has six sections: Introduction, Institutional Arrangements, Legislation and Agreements, Financial Mechanisms, Facilities and Services, and Conclusions and Recommendations.

The Introduction describes the general geographic, environmental and policy setting, and Straits uses and users, including shipping traffic and accidents, coastal industrial development, fisheries and mining. It concludes with a review of current coastal state perspectives.

The section on Institutional Arrangements includes a review of the national, regional and international institutional arrangements, which are being employed to support environmental management of the Straits. The analysis includes national, regional and international arrangements, the policy or instrument which establishes the authority; the terms of reference or mandate of the coordinating body or agency; its mode of operation, the effectiveness of the arrangement and lessons to be learned from the experience.

The section on Legislation and Agreements focuses on conventions, policies and agreements that the three Straits States have signed bilaterally or multilaterally, and are in the process of implementing. This section aims to examine the substance of significant policies, legislation and agreements which shape the ways and means that the littoral States manage or cooperate in the management of the Straits; to give an appreciation of how the various national governments have approached implementation/fulfilment of their obligations

[1] *Throughout the document, the use of 'Malacca Straits' or 'Straits' is synonymous with the 'Straits of Malacca and Singapore'.*

under the agreements; to examine the roles and responsibilities of the private sector under such agreements and how the private sector has responded; to explain the impact of such agreements on the management of the Straits, as well as the problems and constraints that need to be addressed; and to determine the lessons to be learned from the experience in the Straits.

The policies, legislation and agreements considered include international and regional conventions, treaties, protocols, bilateral and multilateral agreements on navigational safety and marine pollution and the supporting national legislation or instruments for each agreement; international and regional conventions, treaties and protocols and bilateral and multilateral agreements on resource development and management and biodiversity conservation; and miscellaneous bilateral and multilateral agreements.

The section on Financial Mechanisms reviews the various economic instruments and practices that have been established locally, nationally and regionally to support marine pollution prevention and management programs in the Straits. This section aims to identify mechanisms and the manner in which they are implemented regionally, nationally and locally; to examine the contributions that such mechanisms make toward financing programs, capital works and operating costs associated with marine pollution prevention and management in the Straits; discuss the constraints and limitations of existing mechanisms from the perspective of the Straits States and the user States; and discuss the lessons learned.

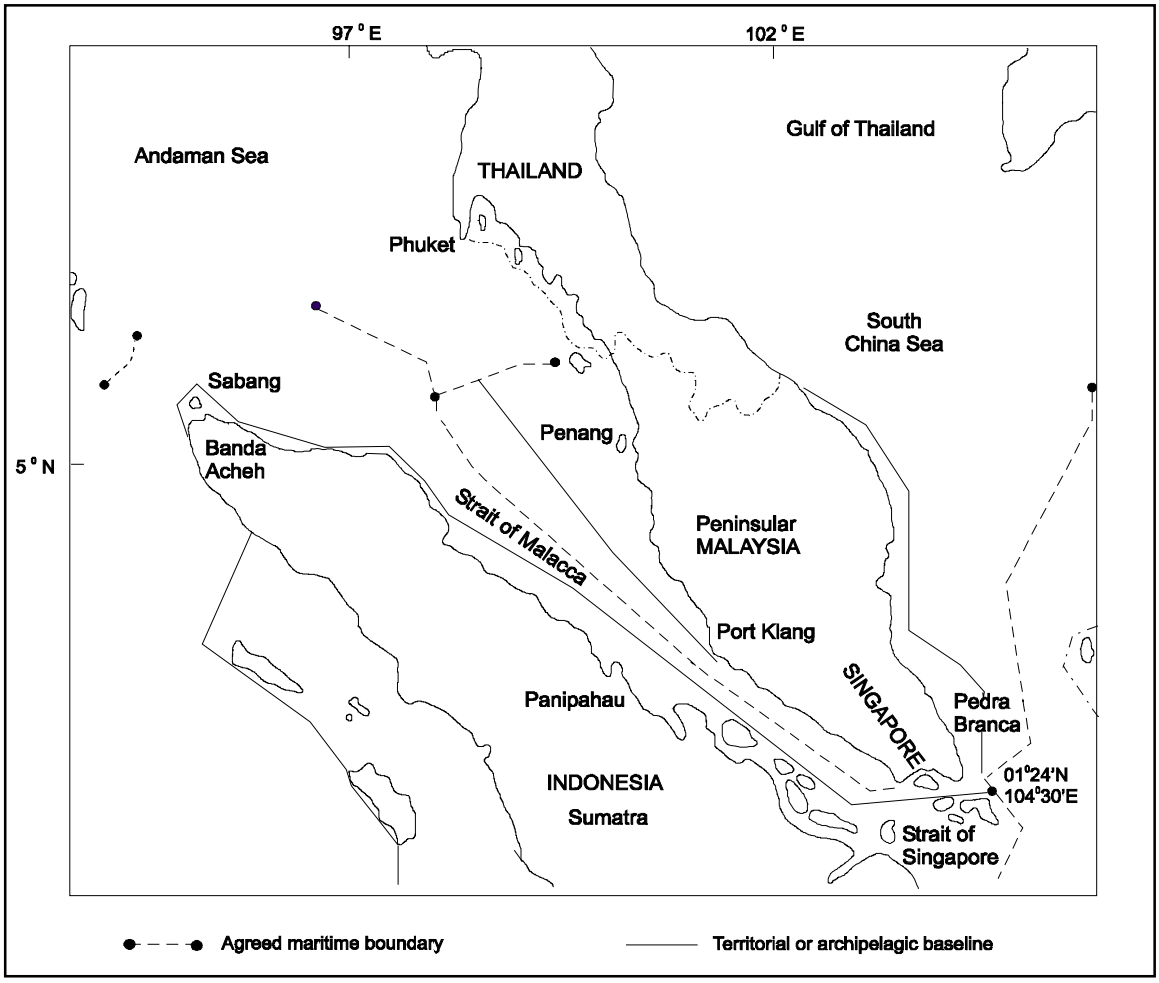
The section on Facilities and Services identifies the facilities and services that have evolved over the years for maritime safety and marine pollution management in the Straits. The emphases are on: the cooperative/collaborative arrangements between the Straits States on issues such as standards, guidelines, regulations and controls for both navigational safety and marine pollution measures and mechanisms in the Straits; the monitoring and evaluation of the effectiveness of such facilities and services; the constraints or limitations of the current practices; and the lessons to be learned.

The section on Conclusions analyze the existing arrangements among the three littoral States for managing the Malacca Straits and determine the adequacy and viability of the mechanisms to develop and implement risk assessment/risk management and response strategies on a sustainable basis in the Straits and elsewhere in the region. The section considers the previously reviewed components, examines how to take advantage of the lessons learned, and suggests improved programs. In particular, the section proposes a coordinating framework for pollution risk assessment/risk management for the Malacca/Singapore Straits; enhanced linkages among regional and international institutes, agencies, organizations and programs to strengthen coordination of activities and ultimately, the management of subregional seas; improved working mechanisms to implement, finance, monitor and enforce conventions and agreements, including the provision of required facilities and services, on a sustainable basis.

General Setting

The Malacca Straits is a microcosm of the coastal activities and use conflicts in the region (Abu Bakar Jaafar and Valencia, 1985a) (Figure 1). The Straits is a major transport route for oil tankers, however, hazardous to navigation due to its shallow and narrow channels and shifting bottom topography. The nearest substitute for most through navigation is the Sunda Strait between Sumatra and Java but, it is too shallow for very large crude carriers (VLCCs). The Lombok Strait off Bali is deep and wide enough to reduce the risk of accidents but adds considerable mileage. The Malaysian ports of Penang, Klang, and Dickson, the Indonesian port of Dumai and the world class Port of Singapore are situated on the Straits. Refineries are located in Port Dickson, Sungei Pakning, Dumai, Singapore and Batam.

Figure 1. The Malacca Straits.



In addition to Singapore, the west coast of the Malay Peninsula is rapidly becoming urbanized. Much of Malaysia's population and industrial/agricultural processing activities are concentrated here, discharging wastes into the Straits, including herbicides and pesticides.

In 1993, samples collected off Kedah, Malacca and Negeri Sembilan exceeded the zero tolerance limit for oil and grease. Those collected near the Riau archipelago had hydrocarbon levels as high as 1,000-11,500 μg/L. Sublethal effects on mussels (*Mytilus edulis*) can be observed at 20 μg/L (Chua et al., 1997).

Tin mines are scattered throughout the Thai Isthmus and the Malay Peninsula, and logging activity is significant in Sumatra, all generating much sediment and contributing to coastal accretion. Petroleum is being produced along the coasts of north and central Sumatra and petroleum exploration is occurring off Southwest Thailand and the western coast of the Malay Peninsula. Bottom tin mining is occuring from Phuket northwards, and exploration has been undertaken off Johor, Malacca, Negeri Sembilan and Penang.

Meanwhile, aquaculture is being expanded in north Sumatra and in suitable locations along Peninsular Malaysia's west coast. Mangrove harvesting is locally significant throughout the coastal area of the Straits. Artisanal fishing, including shellfish harvesting, is widespread in the northern part of the Straits. Tourism/recreation centers bordering the Straits include Phuket, Penang, Pangkor and Sentosa. Marine research stations are located at Phuket, Penang and Singapore. Some zoning has already taken place in the form of different jurisdictional regimes and sealanes (Figure 2). Indonesia and Malaysia have declared 12 nautical mile (nm) territorial seas and 200 nm exclusive economic zones (EEZs). Indonesia has also declared archipelagic waters (Beckman, 1996). Where the breadth of the straits is more than 24 nm, the jurisdictional regime of the Straits is divided between territorial waters and EEZs (Figure 2).

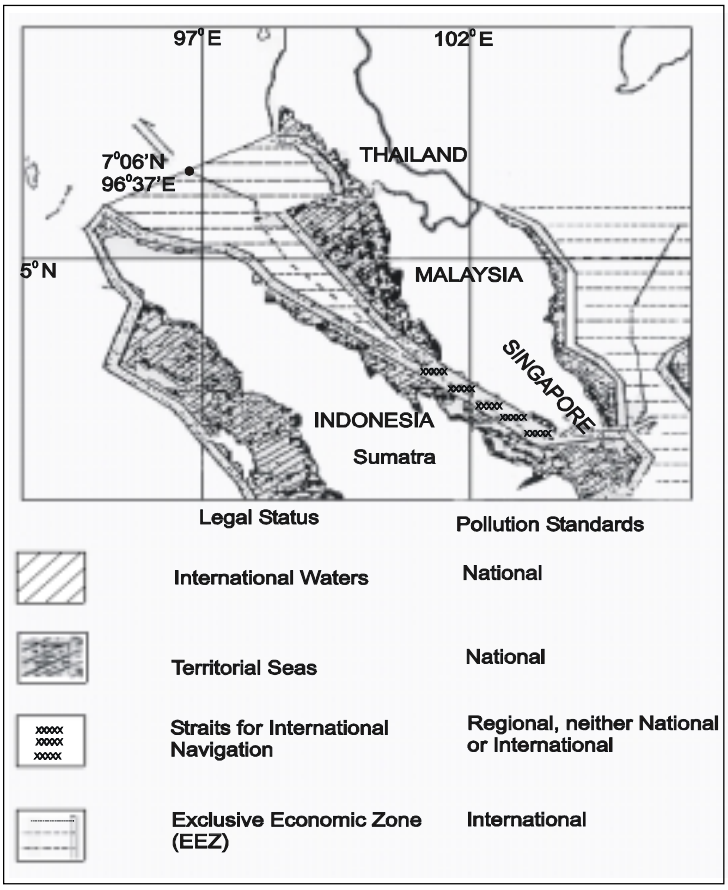
The outputs of the region are clearly competitive in some areas (Table 1). Logging and agro-industrial waste disposal damage fisheries and tourism; cross-traffic and fishing vessels may create hazards for tankers in transit and vice versa. It is not clear, however, that the outputs must be competitive regionwide. Optimal management should include a general reduction of some activities and some major reallocations within the region toward subregional specialization.

Straits Uses and Users

Shipping

The shipping industry worldwide is facing increasing difficulties. Many pressures are eroding the standards of operation while governments, insurers, financial institutions and users are increasing their efforts to monitor these standards. Meanwhile, the quest for safe and environment-friendly shipping involves widely diverging interests with often

Figure 2. Jurisdiction in the Malacca Straits.



Source: Abu Bakar Jaafar (1984: Figure 3).

conflicting or overlapping claims to competence in standard-setting and enforcement. The seemingly endless string of inspections increases the room for conflict as every 'competent body' seems to have its own subjective view of what compliance or non-compliance means. The myriad of regulatory requirements and voluntary codes obviously needs to be sorted out. The result of these conflicting pressures is maritime anarchy. Indeed, this lack of agreement over what constitutes probably the key issue for shipping-demarcation of authority-makes risk management that much more difficult in an industry which is cyclical by nature.

Some critics allege that the sea-change now in progress has even threatened to erode the credibility of the International Maritime Organization (IMO) (Morgan et al., 1993) . The IMO maintains that safety and the prevention and control of pollution from ships remain global problems requiring global solutions. It argues that unilateral action, whether by government or industry is not a viable substitute for raising global standards. Skeptics, however, argue that the IMO has never really succeeded in achieving international harmonization of standards of sufficiently high quality in terms of their safety and environmental effectiveness. This is so, they claim, because it continues to rely wrongly on flag State administrations for the enforcement of its conventions, rules and standards.

The recent decision by Turkey to unilaterally change passage rules in the Bosphorous Strait is an example of what a Strait State may do, driven by what it perceives to be the right of preservation and protection of its environment[2]. While many countries have protested the Turkish decision, Turkey feels it has a 'natural right' to change the rules of the game.

[2] *Note by Turkey, Navigational and Environmental Safety in the Turkish Straits. IMO Doc. MSC 62/INF.10, March 1993.*

Table 1. Activity/Issue Matrix for the Malacca Straits.

Activity	Shipping	Fishing	Mining	Environmental Protection	Security	Boundary Resolution
Shipping	Cross-channel vs. transit traffic	Traffic in fishing areas		Oil spills Other pollution from vessels Regional contingency plan Regional SASRAT*	Smuggling Piracy Illegal trafffic/ discharges Regional traffic surveillance	
Fishing	Fishing in traffic lanes	Traditional rights Access to surplus stocks Trawling vs. traditional fishing Regional fish-marketing		Resource depletion	Poaching	
Mining	Interference or obstructions	Displacement of fisheries	Uncoordinated development	Regional contingency plan for blowouts Pollution		
Environmental protection	Pollution from ships			Pollution from land-based sources		
Security					Regional surveillance and enforcement	
Boundary resolution	Port development	Undefined property rights	Undefined property rights	Unregulated vessel discharges	Boundary/ location area gained	

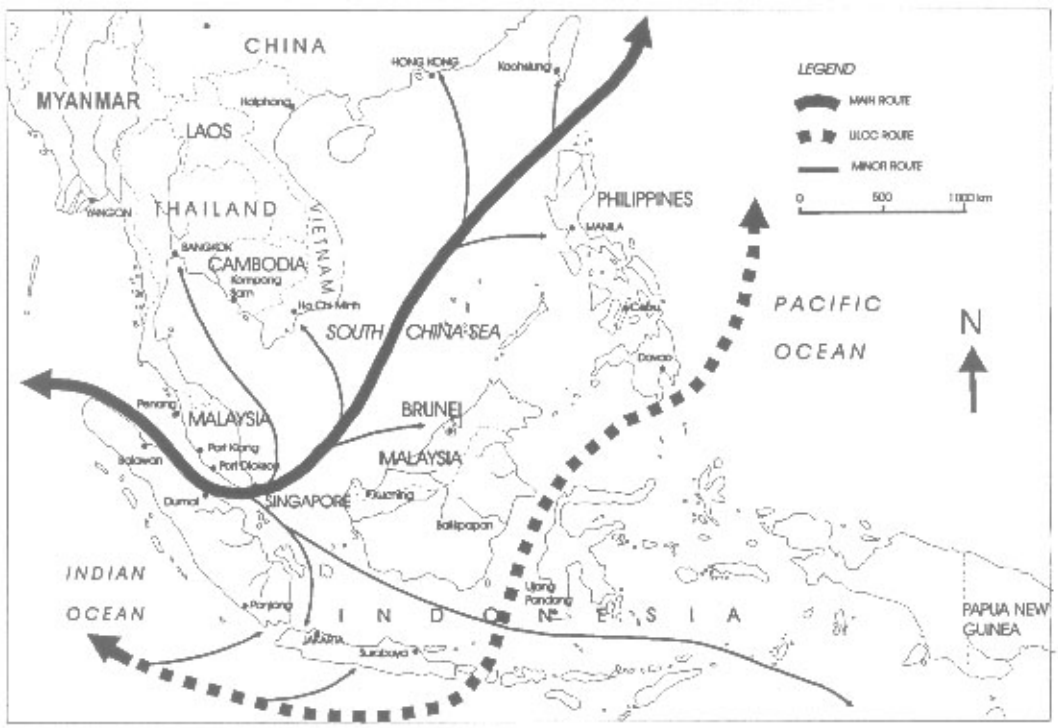
***** Slop and Sludge Reception and Treatment Center.

Source: Abu Bakar Jaafar and Valencia (1985a).

Further, if unilateral action is to be condemned, it has to be condemned consistently and on a non-discriminatory basis, including e.g., those relevant unilateral actions of the United States.

The Europe-Far East shipping route that traverses the Malacca and Singapore Straits and the South China Sea is one of the busiest in the world (Figure 3). Some 90% of Japan's oil imports move through this region as do most of the oil imports of Republic of Korea and Taiwan. Oil moving to China and Hong Kong along this route is also increasing. Eastbound tankers proceeding along the Malacca/Singapore Straits through the South China Sea are generally loaded with crude oil from the Middle East and bound for East Asia. They also carry crude oil from Nigeria and Algeria (International Petroleum Encyclopedia, 1993). The United States retains the option of using the South China Sea to transport crude from the Middle East to its west coast.

Figure 3. Pattern of Oil Tankers Routes in Southeast Asia.



The alternative route for very large crude carriers (VLCCs), 200,000 - 300,000 gross registered tonnes (grt), and ultra large crude carriers (ULCCs), greater than 300,000 grt, is through the deep Lombok-Makassar Straits and the Celebes Sea south of Mindanao, through the Surigao Strait and on through eastern Philippine waters. VLCCs save about 1,000 miles or 3 days by using the Malacca Straits and ULCCs coming from the direction of South Africa save 200 miles. The Malacca Straits route is used by 72% of eastbound loaded tankers, while the Lombok-Makassar Straits route is used by the rest. In terms of dead-weight tonnage (DWT) as well as the volume of oil carried, however, the share is about even. All tankers, including ULCCs in ballast can use the westbound route through the Straits (Fairplay International, 1993).

Shipping Traffic

Total ship traffic through the Malacca Straits of all types and sizes averages more than 150 vessels per day, of which half are ships with sizes of more than 5,000 grt, while those exceeding 30,000 grt make up over 10% of the total. A ship either enters or leaves Singapore harbor on an average of every two minutes. In 1996, 117,723 vessels called at Singapore for an average of 9,000 vessels per month. Traversing Singapore Strait to enter or leave the port is like crossing a busy intersection without traffic lights. In 1994, 1995 and 1996, the number of vessels passing the One Fathom Bank Lighthouse was 34,446, 30,251 and 31,672 respectively, excluding vessels stopping at Port Klang and fishing vessels (Dow, 1993). About 35% of these were oil tankers, i.e., 11,069, 8,915, and 9,815 respectively

(Tables 2 and 3). Thus, an average of 30.3, 24.4 and 26.9 oil tankers per day passed through this section of the Straits in 1994-1996. More than 60% of these tankers were larger than 200,000 grt (Hamzah and Basiron, 1996)[3]. As much as 90% of the Straits of Malacca shipping traffic is purely foreign flagged.

Merchant Marine and Oil Tanker Fleets

China, Japan, Republic of Korea and Taiwan have become major ship owning nations (Table 3). Japan is ranked number one in the world, China, 6th, Republic of Korea, 8th and Taiwan, 30th in terms of number of vessels (The Economist, 1994). All of these States rank among the top twenty shipowning nations in terms of cargo carrying capacity.

In terms of the number and capacity of oil tankers, Japan's fleet with over 7.2 million grt greatly exceeds that of other East Asian States, but they also possess sizeable oil tanker fleets. Many of Japan's tankers fly foreign flags in part because of the high cost and non-availability of Japanese seafarers. China has dramatically increased its fleet in recent decades and has become a major stakeholder in merchant shipping worldwide. The average age of oil tankers owned by Republic of Korea is 19 years which is close to that of Vietnamese tankers, compared to the much younger tanker fleets of Japan (10 years) and Taiwan (9 years). Age is a factor in tanker mishaps. The 1993 annual flows by vessel type and direction through the Malacca Straits is shown in Table 4.

Users of the Straits

In 1993, crude oil accounted for 58% of the interregional cargo tonnage flowing through the Straits of Malacca and Singapore (Noer and Gregory, 1994). Most came from the Arab Gulf and went to Japan, with Southeast Asia as a secondary source and the newly industrializing economies (NIEs) as the number two destination (Figures 4a, 4b, 4c). Finished goods, including automobiles, machinery and consumer products, accounted for over 60% of the value of cargoes passing through the Straits.

Japanese interests owned 27.6 % of the tonnage passing through the Straits in 1993, four times more than any other nation (Table 5). Greece was second with 6.5%, and the United States was third with 6.2% of the tonnage. The rest of the top ten owning nations are divided between maritime nations, such as the United Kingdom and Norway, and Asian nations, such as Singapore and Republic of Korea. The majority of owners in large states, e.g., Japan, Greece and the United States, fly flags of convenience. Norway, Taiwan, and Malaysia are exceptions.

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[3] *Another source puts the percentage of supertankers at 33% and petroleum and petroleum product carriers at more than 50% (Noer and Gregory,1994).*

Table 2. Shipping Traffic in the Malacca Straits by Type of Vessel (percentage).

Type of vessels	Year										
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Tanker	35.5	40.0	37.3	35.6	35.3	34.3	32.9	32.1	28.5	31.0	31.2
Container	8.2	10.3	14.5	14.2	15.3	16.4	16.4	16.7	17.0	18.3	18.1
Tug	3.9	4.4	4.0	4.1	4.8	4.2	4.1	4.6	5.8	6.0	5.5
Fishing	5.0	6.9	5.8	5.6	4.2	4.5	4.5	4.7	5.8	5.1	4.2
Ro-ro	1.7	1.8	2.5	2.3	2.8	3.4	3.8	3.2	4.0	.4	3.5
Passenger	0.8	0.7	0.6	0.8	0.7	1.0	0.8	1.3	2.2	1.8	1.5
Naval Craft	1.2	0.9	1.0	1.3	1.5	1.1	1.0	1.4	1.4	1.0	0.9
Cargo Carriers	43.6	36.8	34.3	36.3	35.1	35.1	36.1	35.8	34.3	3.9	35.1
Others	0.2	0.0	0.0	0.1	0.2	0.1	0.2	0.2	---	---	---

Source: From the number of ships passing off One Fathom Bank in the Straits of Malacca furnished by the Marine Department, Peninsula, Malaysia.

Table 3. Merchant Shipping and Oil Tanker Fleets of East Asian States, 1992.

Flag State	No.	Cargo Carrying Ships		Oil Tankers		
		'000 GT	Av. Age (yrs)	No.	'000 GT	Av. Age (yrs)
Japan	5,560	23,687	9	1,062	7,167	10
China	1,680	20,043	16	258	1,721	15
Taiwan	267	9,312	12	23	969	9
Hong Kong	347	12,276	13	43	880	16
Republic of Korea	755	11,026	15	90	612	19
Vietnam	191	392	14	13	15	18
World	41,393	420,806	17	6,342	138,149	16

Source: Lloyd's Registry of Shipping, Statistical Tables, 1992.

Table 4. Annual flows (1993) by Vessel Type and Direction via the Malacca Straits.

Transits	Voyages[a]	MDWT[c]
Eastbound		
VLCCs(crude<160K DWT)	1,122	286
Tankers (crude<160K DWT)	1,895	80
Largebulk(>100KDWT)	130	19
Bulk (<100K DWT)	2,589	88
Product (petroleum & chemical)	2.514	74
Combo (wet & drybulk)	82	10
Cellular (container)	3,611	86
General cargo	6,174	65
Special[b]	2,801	64
Total eastbound	20,918	773
Westbound	20,591	793
Total	41,509	1,566

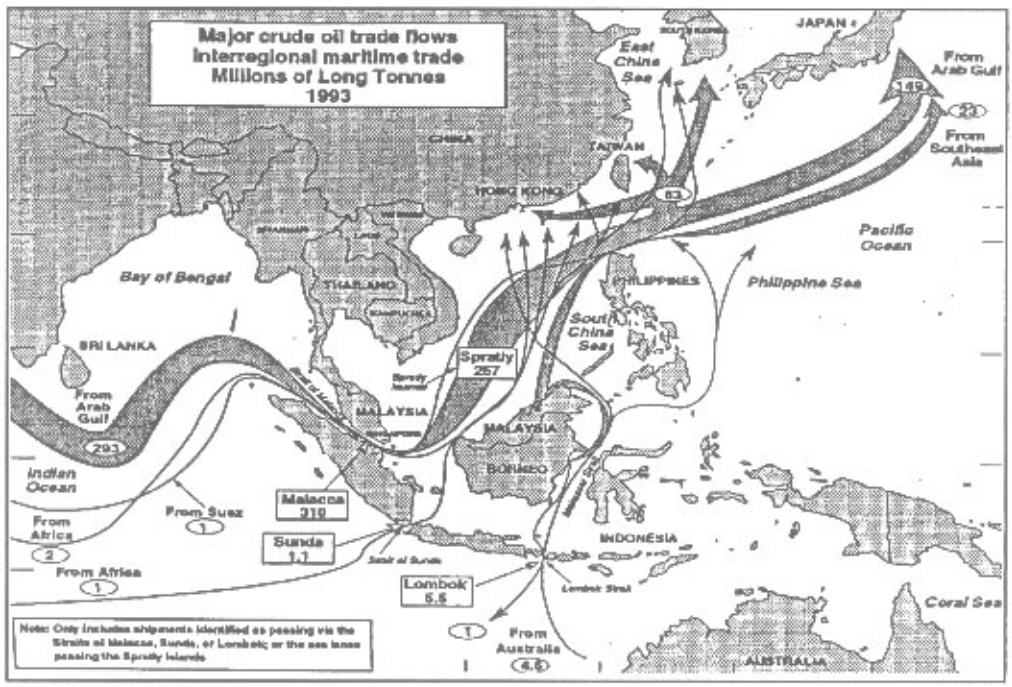
[a] Includes only interregional ship movements of vessels over 1,000 DWT on international voyages. Does not include ferries, passenger liners, fishing vessels, warships or any vessels not carrying cargo (such as new vessels in delivery).
[b] Special includes Ro/Ro gas tankers, reefer, vehicle carriers and others.
[c] Million dead weight tonnes

Source: Noer and Gregory (1994).

Table 6 shows total tonnage and transits through the Malacca Straits by flag of registry, for common flags. Half or more of the traffic flies flags of convenience. The percentage of traffic owned by nationals foreign to the vessel's flag is also shown. The first four by flag are Panama, Liberia, Japan and Singapore, followed by Greece, the Bahamas, Cyprus and Norway.

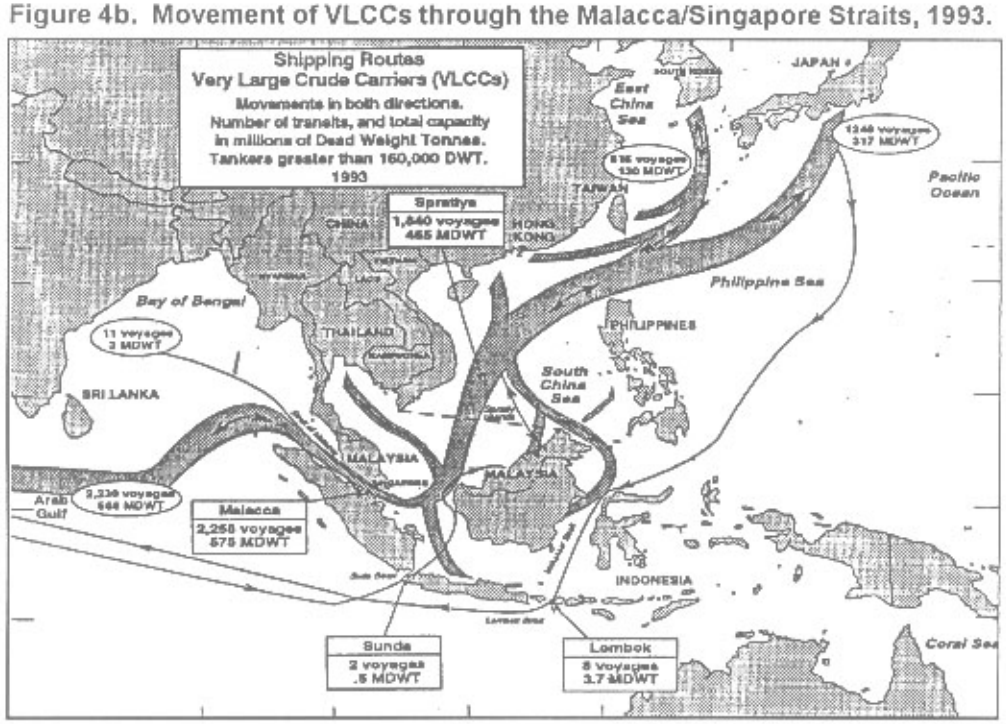
Some flags are purely flags of convenience, e.g., Panama, Liberia and the Bahamas. Some are mainly for convenience, or, perhaps more accurately, they also shelter the company of ownership, e.g., Cyprus and Malta. A few flags have many foreigners as well as nationals owning vessels, e.g., Singapore and Greece. Many nations have few foreigners flying their flag, such as Japan, Norway, Taiwan, China and the United States.

Figure 4a. Major crude oil trade flows in Southeast and Northeast Asia, 1993.



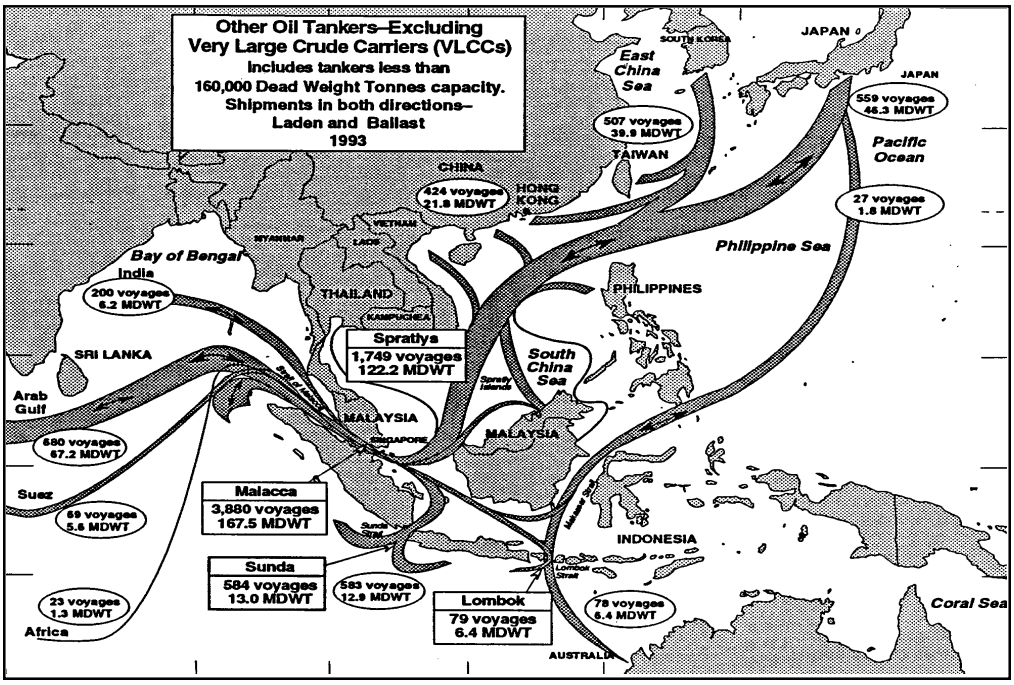
Source: Noer and Gregory (1994).

Figure 4b. Movement of VLCCs through the Malacca/Singapore Straits, 1993.



Source: Noer and Gregory (1994).

Figure 4c. Movement of other tankers through the Malacca Straits, 1993.



Source: Noer and Gregory (1994).

Table 5. Using of Flags of Convenience (1993) by Owner via Malacca Straits (where ownership capacity is greater than 35,000 DWT).

Nationality of Vessel Owner	MDWT[a]		Percentage of fleet Flagged Out[b]	
	Capacity	Voyages	Capacity	Voyages
Japan	432	7,146	62	78
Greece	102	2,445	67	71
United States	97	1,177	77	64
Great Britain	90	1,218	91	89
Singapore	88	5,277	50	40
Norway	68	1,443	32	37
Republic of Korea	66	949	67	45
Hong Kong	63	1,618	85	89
Bermuda	40	202	100	100
Denmark	39	1,062	56	47
Taiwan	39	1,266	22	32
Malaysia	36	3,097	3	2

[a] Million dead weight tonnes

[b] When the nationality of ownership does not equal the nationality of registry, the vessel is said to be "flagged out."

Source: Noer and Gregory (1994: Tables 4 and 30).

Accidents

Table 6. Foreign Ownership (1993) by Vessel Registry (Flag) via the Malacca Straits (where flag capacity is greater than 19,000 DWT).

Nationality of Flag	'000 DWT		Percentage of Fleet Foreign-owned	
	Capacity	Voyages	Capacity	Voyages
Panama	351	7,777	100	100
Liberia	228	3,382	100	100
Japan	176	1,653	7	6
Singapore	101	3,930	56	19
Bahamas	64	1,263	100	99
Greece	64	1,030	47	30
Cyprus	60	1,551	83	83
Norway (NIS)	50	985	8	8
Malaysia	41	4,012	15	24
Taiwan	31	884	4	3
China	30	1,406	5	1
Malta	26	870	97	97
United States	25	455	8	6
Republic of Korea	24	590	10	11

Source: Noer and Gregory (1994).

The current common concern of the littoral Straits regarding shipping is oil discharged during routine passage of ships and accidental oil spills from mishaps involving ships, particularly oil tankers. Although marine casualties are the most dramatic sources of oil pollution, routine discharge of bilge water, cleansing of ballast and oil tanks, and leaks are also important sources of oil pollution. From 1975, when the traffic separation scheme (TSS) for deep- draft vessels was implemented to 1992, there were few accidents involving tankers. But at the end of 1992, two major accidents occurred at the northern entrance of the Straits. These incidents re-alerted the Straits States to this very real hazard and resulted in a series of activities including Malaysia's convening of the National Conference on the Strait of Malacca on 11 November 1993 and an international conference on the same subject from 14-15 June 1994. Then on 28 September 1997, the supertanker *MV Mount St. Vincent* collided with an Indian registered cargo ship sinking the cargo ship with a loss of 29 lives (Honolulu Advertiser, 1997).

Between 1977 and 1992, there were 71 shipping casualties in the Straits, (Table 7) with 60% occurring since 1987 [4]. Collisions and groundings are the most common types of marine casualties. Although general cargo vessels account for the largest percentage of

[4] *Another source records 476 casualties averaging 30 per year (Lloyd's Maritime Information Services, 1994 as cited in Hamzah and Basiron, 1996).*

casualties (Table 8), it is the number of tanker casualties (17%) that is of greatest concern to the littoral States because they possess the potential to cause serious pollution damage to the environment. There have been 54 such oil spill incidents in the Straits of Malacca since 1975 (Table 9). The major incidents resulting in large oil spills included the *Showa Maru*, the *Diego Silang* and the *Nagasaki Spirit* (Table 10). The combined spill from these three incidents alone was more than 26,000 metric tons of oil.

Table 7. Type of Shipping Casualties in the Malacca Straits, 1977-1993).

Type	Number
Collision	25
Grounding/Stranding	13
Explosion/Fire	5
Foundering	7
Others	21
Total	71

Source: Chua et al. (1997).

In mid-October 1997, the Malacca Straits suffered from the largest oil spill to date — about 28,500 tonnes of heavy marine fuel oil — from the loaded eastbound tanker *Evoikos* which collided with the empty westbound tanker *Orapin Global* (Reuters, 22 October 1997).

Table 8. Breakdown of Shipping Casualties in the Malacca Straits, 1977-1993.

Ship Type	Number of Incidents	Percentage
Container	3	4
Fishing	11	15
General Cargo	23	32
Government Craft	4	6
Passenger	6	8
Tanker	12	17
Tug	5	7
Others	7	10
Total	71	100

Source: Chua et al. (1997).

The 20.5-mile long slick drifted into Malaysian and Indonesian waters. Some 16 agencies, 60 vessels and a team of Japanese experts were engaged in the round-the-clock battle to fight the oil spill (AFP, 6 November 1997). At the time of the accident, visibility at 8 km was good, the shipping lane was not congested, and the port's navigation equipment was functioning perfectly. The VTS had warned the westbound empty tanker *Orapin Global* that it was in the wrong lane and warned both ships three times that they were on a collision course. However, the managers of the Thai-registered *Orapin Global* claimed that the eastbound *Evoikos* cut across the lane for westbound traffic at a narrow angle, rather than at a right angle as required by the TSS.

Table 9. Number of Oil Spill Incidents in the Straits of Malacca, 1975-1996.

Year	Total
1975	1
1976	1
1977	1
1978	1
1979	0
1980	1
1981	2
1982	2
1983	0
1984	1
1985	2
1986	7
1987	4
1988	8
1989	5
1990	2
1991	3
1992	5
1993	10
1994	5
1995	26
1996	31
Total	116

Source: Muhammad Razif Bin Ahmad (1994).

On 20 October 1997, the captains of the two tankers were arrested by Singapore authorities (AFP, 20 October 1997). The ship's captains were charged with reckless navigation and endangering (failure to take appropriate action to avoid the collision and failure to reduce speed to prevent serious damage) human lives. The *Orapin Global* was impounded by Malaysian authorities when it was found illegally anchored in its water.

Growth Triangles and Shipping Traffic

Singapore and Malaysia are relatively advanced in finance, communication and marketing infrastructure and expertise, while Indonesia and Thailand have abundant labor with lower wage rates, ample land areas and rich natural resources. A combination of these factors would offer a unique mix of resources, infrastructure, labor, skills and product marketing opportunities. The "growth triangles" in the southern and northern entrances of the Straits of Malacca are designed to harness these complementary factors.

The "growth triangle" in the southeastern entrance of the Straits links Singapore, the Malaysian State of Johor and the Riau Province of Indonesia (SIJORI). Originally, activities within this "growth triangle" were concentrated on Batam Island in Riau Province, a group of islands 20 km southeast of Singapore which is being developed by Indonesia as an industrial estate. Foreign investments have grown from US$65 million in 1988 to US$300 million in 1990. In the same period, the value of exports rose from US$44 million to US$150 million. Batam has surpassed Medan as a tourist destination and is second in Indonesia only to Bali. The Riau Provincial Government is embarking in major tourist resort development on other islands around Batam, including Bintan. Of the total investment of US$3.8 billion in Batam up to 1993, US$3.1 billion (82%) came from the private sector and the rest—US$681.4 million—from the government.The investments were 49.5% in industries, 16.8% in tourism, 17.8% in real

estate, 13% in services, 2.9% in agro-business and 0.9% in the commercial sector (Chua et al., 1997).

A side effect of the Batam development is rapid population growth—from about 6,000 in the 1970's, to 198,000 in 1995 or a 19% increase per year. The actual number is nearly double the official count due to illegal job-seeking migrants from other parts of Indonesia. The official projected population is 700,000 by the year 2006.

The Batam Island Development Authority has various multi-million dollar projects underway such as a second runway and new terminal at the Hang Nadin Airport, a new cargo terminal, a 16,000 TEU-capacity container port terminal at Kabil, additional water supply dams and six BARELANG bridges, connecting Batam Island with its neighbouring islands of Setokoh, Rempang, Galang and Galang Baru.

Table 10. Major Oil Spill (over 1,500 tonnes) from Tankers in the Malacca Straits, 1975-1997.

Year	Tanker Name	Cause
1975	Heiwa Maru	Grounding
1975	Showa Maru	Grounding
1976	Mysella	Grounding
1976	Diego Silang	Collision
1976	Sealift Pacific	Grounding
1978	Sealift Mediterranean	Grounding
1978	Kountouriotis	Fire/Explosion
1979	Fortune	Collision
1980	Lima	Collision
1983	Monemvasia	Grounding
1987	El Hani	Grounding
1988	Century Dawn	Collision
1992	Nagasaki Spirit	Collision
1993	Maersk Navigator	Collision
1997	Evoikos	Collision

Modified from White (1994).

A second "growth triangle" is being developed in the northern entrance of the Straits, linking Aceh and North Sumatra provinces of Indonesia with the five southern-most provinces of Thailand and four northern states of Malaysia—the Indonesia-Malaysia-Thailand Growth Triangle (IMTGT). The combined population of the area exceeds 20 million, with economic output in 1988 of US$12.4 billion (Chua et al., 1997). This "growth triangle" was originally planned to link the tourist resort areas in Southwest Thailand (Phuket and Suratani), the northwest coast of Malaysia (Penang and Langkawi) and North Sumatra (Toba Lake and surroundings). However, the latest development plan envisions expanding the cooperation to include agro-industries, industrial estates, tourist resorts, upgraded port facilities for cargo and fisheries.

The development of "growth triangles" at both ends of the Malacca Straits will generate heavier shipping traffic, both for cargo and trade, as well as passengers, among the ports of the cooperating coastal states. This will create more congestion and collisions and thus increase the risk of pollution from sea-based sources. The industrial and agricultural development will also add to the land-based pollution load entering the Straits.

There are also several industrial projects slated to come on stream along the east coast of Sumatra (Mochtar Kusuma-Atmadja, 1994). Some of these projects are huge such as the Asahan aluminum project and the pulp mill project in Aceh Province. There are also several important oil and gas projects underway such as the Arun LNG plant in Aceh province, the Caltex operations at Dumai and near Pekanbaru in Riau Province, and the PERTAMINA refinery near Palembang. Not all of these projects will have direct impact on the marine environment of the Straits, but their contribution to economic growth and development all along the east coast of Sumatra will result in more traffic in the Straits.

Fisheries

Fisheries is an extremely important sector in the Malacca Straits, partly because of the continued reliance of the coastal communities on marine products as a major source of animal protein, and partly because a significant proportion of the coastal population is employed in this sector. High standing crops of fisheries and other commercially important marine products in the Strait are attributed to the euryhaline conditions, rich nutrient levels, shelter from strong currents and wave action, high but rather uniform temperatures and adequate tidal flushing. These attributes support a rich mix of marine flora and fauna from both the Indian and the Pacific Oceans.

Fish production in the Straits of Malacca was about 865,000 metric tons in 1990 and 884,000 metric tons in 1993. Indonesia and Malaysia each took about half of the total fish catch. There are 139 fishing villages along the west coast of Peninsular Malaysia, and about 70% of the population is supported by the Malacca Straits fisheries. However, the number of fishers in Malaysia constitute less than one-seventh of the total fisher population in the Malacca Straits and employ about 21% of the total number of fishing boats, constituting 16,000 registered boats which, almost all, are powered and highly mechanized. The cumulative effect of oil discharged from these vessels is significant. In 1994, nearly 60% of all Malaysian landings came from the Straits while Indonesia's fisheries catch from the Straits ranked second only to that from the Java Sea (Hamzah and Basiron, 1996).

Despite the fact that total landings are increasing, available data on catch per unit effort (CPUE) for the pelagic fisheries in the Indonesian waters indicate sharp declines from 275 kg/hr in 1970 to 194 kg/hr in 1979, and finally to 52 kg/hr in 1982. For demersal fisheries, the CPUE in Malaysian waters decreased from 131.1 kg/hr in 1970 to 55 kg/hr in 1981, and since 1977, Malaysian catches of demersal stocks have exceeded the maximum

sustainable yield of 160,000 tonnes by as much as 12.5%. Obviously, both pelagic and demersal fisheries in the Straits have long been overexploited (Abu Bakar Jaafar and Valencia, 1985a).

Indonesia banned the use of trawls in 1978 despite an apparent need to accelerate the modernization of its fisheries. Indonesia explained this action as a response to the need for conservation of a threatened resource, although the policy was perhaps more motivated by political pressure from *pribumis* ('sons of the soil') whose traditional fishing methods were threatened by non-*pribumis* with efficient trawlers. Indonesian's ban on trawling should help these resources recover, but full recovery can not occur unless Malaysia also implements a ban or at least limits further trawling. And despite the evidence of resource depletion due to overfishing and/or pollution, Malaysia continues its policy of encouraging the use of trawlers. Singapore is not very concerned with the declining fish resources of the Strait as long as it continues to be able to buy its supply of fish.

A pressing problem for Malaysia concerns the number and frequency of its citizens arrested for fishing on the Indonesian side of the Straits. Because there is no harmonization of policies or clear communication between Indonesia and Malaysia on fishing in the Straits, Malaysian fishers who have traditionally been fishing in the middle of the Straits are apprehensive of over reactive enforcement by Indonesian authorities. Compounding the problem, there is no law in Singapore prohibiting its trawlers fishing in neighboring waters now under the jurisdiction of Malaysia or Indonesia.

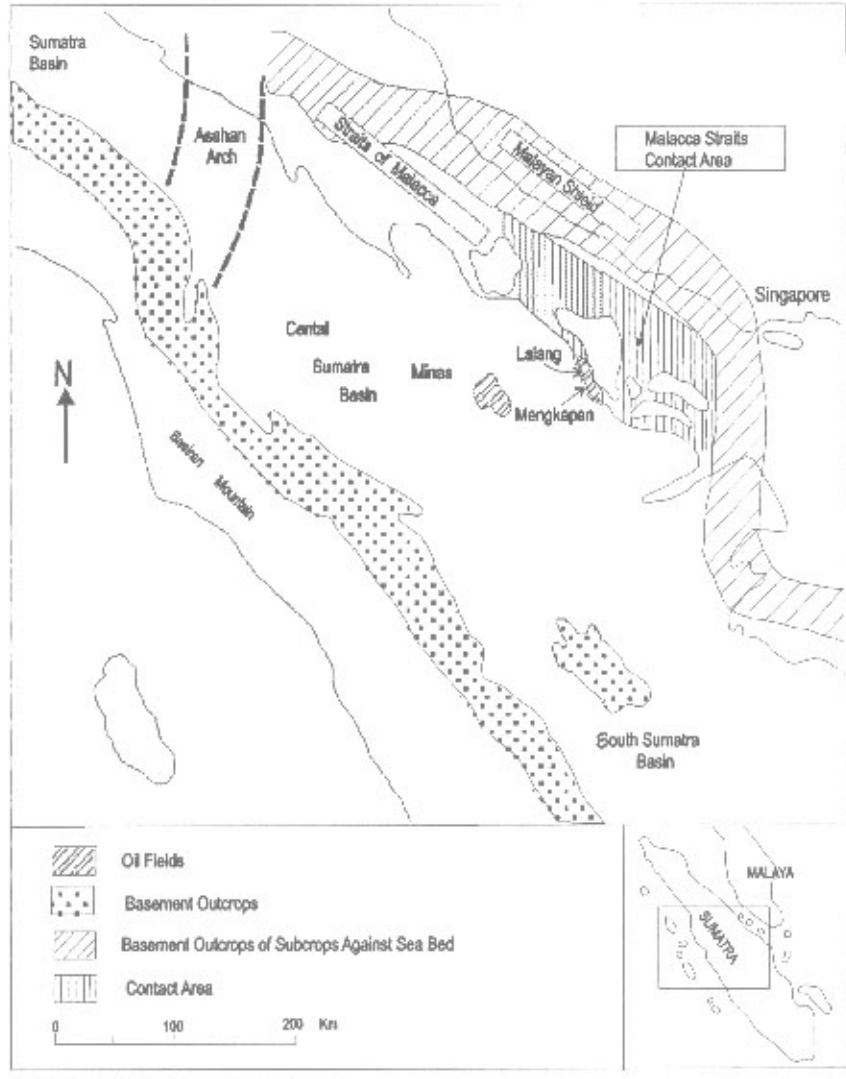
Solutions include mutual recognition of the traditional rights of fishers in neighboring waters, or in the establishment of rights of access to surplus stocks in neighbor's EEZs. However, Malaysia and Singapore have so far failed to work out access agreements with Indonesia, which has insisted on joint ventures rather than unconditional access based on normal licensing systems. Joint ventures were not acceptable to Malaysia and Singapore because the fishers desiring access are in the informal sector and fish with traditional gear and low-powered motor boats.

Fish marketing is another potential area for cooperation, but neither Indonesia nor Malaysia has the necessary capital, infrastructure and free ports to cooperate with Singapore in marketing on a regional basis. A uniformity of fish prices throughout the region would help assure a fair return to fishers and avoid overcapitalization and overexploitation of an already depleted resource. It would also help current efforts toward resource conservation and thus sustained production. In order to achieve price uniformity, the marketing function of the fishery sector in the region must be restructured on a regional basis. Attempts at this by both Indonesia and Malaysia have been made at national levels, but so far, they have been unsuccessful.

Mining

A geological discontinuity, following the long axis of the Malacca Straits divides the tertiary tin-bearing granite terrain exposed on the Malay Peninsula and underlying Malaysian waters, from the tertiary back-arc sedimentary basins evident in East Sumatra and under Indonesian waters (Abu Bakar Jafaar and Valencia, 1985a). Hydrocarbon exploration and development is ongoing and tin mining is a possibility (Figure 5). There is also ongoing salvage work for sunken artifacts and treasures. These activities may physically interfere with shipping and fishing, and through pollution, damage the living and aesthetic resources of the Straits. Regarding mineral resources and petroleum, Singapore concentrates its efforts on downstream activities, and might cooperate in either exploration effort to ensure supply for smelting, or refining and re-exporting.

Figure 5. Hydrocarbon and Mining Possiblilities in the Malacca Straits.



Source: Abu Bakar Jaafar (1994).

Constraints to Cooperation

The constricted, shallow Malacca Straits is a priority area for a coordinated international approach to environmental management by the littoral States. Region-wide cooperation could yield a mutually beneficial distribution of activities and responsibilities.

Indeed, given the narrowness of the Straits and the transnationality of the ecosystems, resources and activities, effective management strategies are dependent upon such cooperation, plus that of the principal extraregional users. Yet, each of the Straits States has different perspectives, policies and approaches to the management of the Straits. For management of the Straits to be effective, these differences must be bridged or harmonized.

For example, although the Indonesian-Malaysian joint declaration that the Straits was not an international waterway reflected common interests, "the initiative was more a product of Indonesian than of Malaysian priorities" (Leifer and Nelson, 1973:191). Indonesia was more concerned with questions of national integration and internal security as manifested by its archipelagic declaration, often challenged by extraregional entities, than with that of pollution from foreign vessels in the Straits (Finn, 1981). Indeed, former Indonesian President Sukarno had long argued that Indonesia would not become strong or secure unless the whole Straits was under Indonesian jurisdiction (Yamin, 1959). Indonesia's Djounda declaration included the Straits within its archipelagic waters. Indeed, Indonesia considered it a sacrifice to treat the Straits of Malacca and Singapore as a unit because Singapore would have some input in Straits management, which it previously did not have.

To Malaysian negotiators and some others at the Third United Nations Conference on the Law of the Sea (UNCLOS III), it has always been clear that Indonesia would rather concentrate on pursuit of international recognition of its archipelago principle than on negotiating an innocent passage regime for the Malacca Straits. Throughout the nine long years of negotiations at UNCLOS III, Indonesia did not insist on innocent passage provisions in archipelagic waters, and remained for a long time content with the newly introduced concept of transit (archipelagic sealane) passage in archipelagic waters as well as in straits used for international navigation (Polomka, 1978:189).

Non-archipelagic states, like Malaysia and other Straits States, were left with the task of clarifying the exact fights of coastal States in straits used for international navigation under the new regime of transit passage. For the Malacca Straits, Malaysia took the lead as coordinator of the Straits States. Japan acted on behalf of the major maritime states[5], holding a series of meetings for the purpose of interpreting the meaning of Article 233 of UNCLOS in its application to the Straits of Malacca and Singapore.

Malaysia was always more concerned with the control of navigation and the prevention of pollution in the Straits (Leifer and Nelson, 1973:193). According to Malaysia's former Solicitor General Zakaria, "the problem confronting the Straits is basically the question of the safety of navigation."(Zakaria Yatim, 1978, 1979). At the Second Session of Plenary

[5] *Includes France, the Federal Republic of Germany, Norway, the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States.*

Meetings of UNCLOS III, the Chairman of Malaysia's delegation to the Conference reiterated that Malaysia "was very conscious of the grave danger of marine pollution [and that] so little importance seemed to be attached to the security and other legitimate interests and concerns of coastal States, which should not be expected to bear the cost of damage to the marine environment caused by pollution and accidents"[6]

Singapore's concerns were (and are) for local defense, security and navigational freedom for all maritime powers. During the cold war, it was thought that such navigational freedom would effectively neutralize individual great power influence, and perhaps now, the power of any potentially dominant regional State. Second, the oil refining industry in Singapore was built on the assumption of free transit for the most modern tankers of any size (Logaraj, 1978). This is why the Singapore Government only took note of the common position of Indonesia and Malaysia when the Indonesian and Malaysian Governments agreed that the Straits of Malacca and Singapore were not international straits. The original positions of the States on an underkeel clearance (UKC) for ships transiting the Straits were consonant with these different perspectives (Table 11).

The perspectives of Indonesia and Malaysia also differ greatly from that of the maritime powers. For Malaysia, and to a lesser extent Indonesia, the Straits is a multiple-use resource. But for the user States, it is no more than the shortest trade route between the Indian Ocean and the South China Sea. For the users, there is always an alternative to the Straits, albeit an expensive one. For Malaysia, however, there is, for all practical purposes, no alternative to the Straits of Malacca. The fact that Malaysia and Indonesia perceive the Straits as a multiple-use resource, whereas the user nations regard it simply as a sealane, explains the significant divergence in perception between the Straits States and the user States.

Table 11. Proposals for Limiting the Underkeel Clearance for Deep-Draft Vessels.

Factor	Indonesia	Malaysia	Singapore
Squat (m)	1.9	2.0	1.0
Wave action or swell	0.5	0.5	0.5
Safety margin	1.0	1.0	1.0
Human error	1.0	1.0	Nil
Necessary clearance required	4.4	4.5	2.5

Source: April Petroleum News [Sea]11 (1976), Government of Singapore, Technical Group Meeting of Experts (1975) (as cited in Valencia and Abu Bakar Jafaar, 1985).

[6] *'The Straits are fast becoming one of the world's dirtiest maritime backlanes', remarked a Malaysian delegate to the Conference (United Nations, 1973, 1974).*

Institutional Arrangements

A Brief History

In the mid to late 1960s, Japanese shipping and oil interests conducted hydrographic surveys of the Straits of Malacca and Singapore and attempted to negotiate with the three littoral States. Although Japan continued to want to unilaterally conduct hydrographic surveys in the Straits, this was not acceptable to the littoral States, which had declared the Straits to be their territorial waters. In response to a request from the Straits States for Japan to cooperate with them in enhancing the safety of navigation in the Straits, the Malacca Straits Council was established in 1969. A joint survey was then conducted by Indonesia, Malaysia and Singapore with the assistance of Japan. Another survey was carried out from October to December 1970, which identified 37 shallow spots which could be dangerous for VLCCs. This survey eventually resulted in the formulation and implementation of a traffic separation scheme (TSS) to help ships avoid the shallow hazards in the Straits.

On 24 February 1977, a Tripartite Agreement on the Safety of Navigation in the Straits of Malacca and Singapore was signed in Manila, Philippines by the Foreign Ministers of Indonesia, Malaysia and Singapore. The signing of this agreement was the culmination of a process which began with a Japanese proposal to IMO that an internationally recognized TSS be established for the Straits of Malacca and Singapore. In response to this proposal, the Governments of Indonesia, Malaysia and Singapore made a joint statement in 1971 which declared inter alia that any rule relating to the regulation of traffic in the Straits would be the concern of the littoral States only. The joint statement further stipulated that the safety of navigation in the Straits was the joint responsibility of the three littoral States. It also stated that tripartite cooperation was necessary in this regard and that a body for cooperation to coordinate safe navigation through the Straits composed only of the three littoral States would be established. However, the use of the Straits for international shipping in accordance with principles of international passage was fully recognized. This firm position reflected the positions of Indonesia and Malaysia, whereas Singapore merely took note of the statement. This tripartite agreement was acceptable to all the parties concerned because it balanced the protection of the littoral States interest and the interests of international navigation. The fact that both Indonesia and Japan have a tradition of problem solving through consensus was helpful in finding solutions between the competing interests of littoral and user States.

But the full extent of the danger to the littoral States interest was dramatized by the January 1975 grounding of the *Showa Maru*, a 244,000 DWT Japanese tanker, off Buffalo Rock in the Indonesian portion of the Strait of Singapore. This incident prompted the Foreign Ministers of Indonesia, Malaysia and Singapore to issue another joint statement concentrating on the issues of safety of navigation and the payment of compensation for damages. A Council on the Safety of Navigation and Control of Marine Pollution in the Straits was established at the ministerial level assisted by a group of experts on safety of navigation and pollution prevention and remedial measures. Agreement was also reached to establish a TSS and to place limitations on the movement of large tankers.

Because modern construction methods had rendered tonnage measurements less relevant than size for purposes of regulation, UKC was adopted as an alternative criterion for size limitation. Limitations based on size or dead weight tonnage would also have been unfair to westbound tankers and tankers which were not fully loaded. The differences on the UKC between Indonesia and Malaysia, on the one hand, and Singapore, on the other, narrowed after the first meeting. Soon after another marine casualty involving several tankers, final agreement was reached on UKC of 3.5 meters and the establishment of a TSS in three critical areas in the Straits for vessels with a draft of more than 15 meters, e.g., at (1) One Fathom Bank, (2) in the Philip Channel in Singapore Strait, and (3) at the Horsburgh Light area.

Both the Tripartite Agreement and the TSS and its details were adopted by IMO on November 14, 1977 by resolution A.375/Res. 375 (x) entitled "Navigation through the Straits of Malacca and Singapore". The TSS came into effect in May 1980 and was supplemented by the Revolving Fund for combating oil spill from ships on the Straits of Malacca and Singapore.

Malaysia and Indonesia also advocated the use of the alternate route east of Bali and Borneo via the Straits of Lombok and Makassar for laden supertankers. However, while ship owners are quite discreet about this issue, very few, if any, follow this advice (Noer and Gregory, 1994:75-78). Indeed, almost all supertankers on the main oil route from the Arab Gulf to Northeast Asia use the Straits of Malacca and Singapore because it is the shortest route available for supertankers. Further, vessels plying the Malacca Straits can use the facilities of the Port of Singapore, a significant logistical and operational advantage. At least three fully laden eastbound supertankers per day enter the Straits from the west, and some westbound tankers in ballast enter from South China Sea.

The two largest sizes of supertankers operating in the region are affected by the Straits of Malacca and Singapore draft constraint (Table 12). Larger vessels within the range of 160,000 to 250,000 DWT are definitely testing the "officially" recommended limit of 18.5 meters when fully laden, although many squeeze in under 20 meters. Most tankers of the largest size observed in the region, over a quarter million DWT, operate well in excess of any official guideline when laden. Many of the larger supertankers light load, i.e., take cargoes of less than maximum size, to reduce their draft when they sail through the Straits.

Table 12. Supertanker Design Draft (meters).

	VLCC Size	
	160-250K DWT	Greater than 250K DWT[a]
Average draft	19.40	21.20
Standard deviation	1.01	1.36
Maximum	21.40	28.60
Minimum	15.50	18.40

[a] Excludes ULCC > 320K DWT.

Source: Noer and Gregory (1994).

When returning in ballast from their port(s) of discharge, they draw much less water because they are not carrying cargo.

Over half a billion DWT of supertanker capacity passed through the Straits in 1993. There were nearly 2,300 voyages (Table 13). Significantly, most of this traffic is the larger supertankers, those supposedly most affected by the channel depth constraint. With few exceptions, eastbound supertankers are laden with oil. Westbound supertankers are in ballast returning empty to the source of supply. Over 1,100 laden voyages and nearly 300 million DWT of laden vessel capacity throughput are involved. The point is that a significant percentage of these vessel operators face a close judgement call about draft restrictions. Loading too deep may ultimately contribute to an accident while loading too light reduces profits. This trade-off decision between operating cost efficiency and safety is made for many supertanker voyages. Further, a supertanker finding itself on a collision course with another ship may face a difficult choice. The watch officer may be forced to choose between the risk of a collision in the channel and the risk of running aground by leaving the channel. Supertankers may take as much as ten miles to stop, and they have little control at very slow speeds due to loss of steerageway. This is one good reason why accidents happen.

Nevertheless, the Malacca Straits TSS (Malacca TSS) has been very helpful in reducing accidents in the Straits. Unfortunately the Malacca TSS rules resulted in a great increase in incidents of sea robbery of vessels slowing down as they approach the narrow passage in the Philip Channel. However the strenuous efforts of the Singapore and Indonesian navies have virtually eliminated this plague at this location, although such incidents still occur in other parts of the Straits.

Table 13. Supertankers transiting the Malacca Straits (1993).

Supertanker size	Vessel capacity (MDWT)[a]	Vessel transits[b]
160-250K DWT:		
Westbound (ballast)	105.6	452.0
Eastboubd (laden)	105.9	453.0
Over 250K DWT:		
Westbound (ballast)	179.8	669.0
Eastbound (laden)	182.7	684.0
Total supertankers	574.0	2,258.0

[a] Million deadweight tonne

[b] Includes only interrogational voyages, excludes lightering.

Source: Noer and Gregory(1994).

Unfortunately, beginning in 1992, there was a dramatic increase in marine casualties in the Straits of Malacca and Singapore, again alarming the littoral States. The matter gained considerable publicity because of dramatic statements made by important political figures in Malaysia and Indonesia. In particular, suggestions were made that the TSS was no longer adequate and needed to be revised or at least reviewed. Suggestions were also made for either the levying of a toll on ships passing through the Straits or for compulsory pilotage for ships passing through the narrowest portions.

However, closer examination of the problem revealed that many marine casualties could not be ascribed to a flaw in the Malacca TSS or its obsolescence. Statistics provided by all three Straits States revealed that over 90% of the casualties were caused by collisions—not groundings. The underlying reasons for the marine casualties were therefore not hazards to navigation but poor seamanship. Apparently, most accidents were caused by ignorance of the basic rules of road such as "the right of way" of ships passing in opposite directions. Some collisions were also due to the inability of the crewmember at the wheel to understand English. The practice of hiring sub-standard crews by "flag of convenience" vessels has now penetrated the tanker fleets. This cost saving measure is employed because of continuing low world scale shipping rates and the increased costs of operating oil tanker fleets produced by the strict construction and other standards set by the IMO.

THE STRAITS STATES PERSPECTIVES

The negative reactions of Indonesia and Malaysia to the original Japanese proposal for a unilateral hydrograhic survey were predictable. Singapore's position was somewhat different because its economic success had traditionally been dependent on trade and export oriented industries. Over 20% of the crude oil passing through the Malacca Straits from the Gulf is bound for Southeast Asia, arriving at Singapore in large supertankers (Noer and Gregory, 1994:81-82). Singapore is a major refining center, importing crude in large tankers and exporting product all over the region in smaller product tankers. Any policy or set of events that inhibited the use of supertankers in the Malacca/Singapore Straits could increase voyage distances up to 49.7% if the alternative was Lombok-Makassar Straits. But the increase in price for Singapore bound crude would be only 0.6%. More likely, if allowed, the supertankers would reroute a much shorter distance via the Sunda Strait, if they re-routed at all. But it is difficult to imagine that Singapore would easily accept such a constraint to one of its most important industries. Singapore thus has more economic reasons than any other nation to insist upon commercial freedom of navigation in the Straits of Malacca and Singapore. The Northeast Asian nations can always ship through Lombok-Makassar Straits, but Singapore has no realistic alternative to the Straits as it profits from facilitating Malacca Straits traffic to other nations.

An added attraction of the Malacca Straits route over others for through-bound supertankers is operational convenience. The Port of Singapore offers a full range of facilities. With low taxes, competitive prices, cheap bunker fuel, fast turnaround and a minimum of

regulations and restrictions, many large vessels call at Singapore for purely operational reasons. There is no other comparable port situated right next to the main route of the region. Singapore has a stake in serving international through-traffic in the Malacca Straits, and a minimum of sensitive coastline exposed to possible pollution damage. It is thus not surprising that the Government of Singapore has exhibited much less support for the proposed draft and other restrictions than its two neighbors.

Two developments, however, have compelled Singapore to reassess its position. First is the increasingly strong feelings and position of Indonesia and Malaysia on the passage of foreign ships, and the extension of their respective territorial seas to 12 nm which made Singapore nearly "sea locked". Secondly, Singapore can no longer ignore the hazards caused by the increased density of shipping traffic, especially of VLCCs and the potential risk and damage that oil spills entail for the littoral States and their peoples. Indeed, after the October 1997 *Evoikos* spill, Singapore's Communication Minister Mah Bow Tan, said that the present legal regime is inadequate to deal with transiting vessels which commit offenses outside the jurisdiction of states suffering the consequences of such offenses (The Straits Times, 19 November 1997). Further, once Japanese shipping and oil interests became aware of the strong positions of the Straits States, they became very cooperative in carrying out the decisions recommended by the technical experts of the three littoral States.

NATIONAL POLICIES AND MANAGEMENT PRACTICES[7]

Indonesia

Coastal Development and Natural Resource Management

Laws, regulations, decrees and decisions on environmental management and development in Indonesia have their origin in the 1945 Constitution (Undang-Undang Dasar 1945). One of the paragraphs in the Preamble states that "the Government of Indonesia shall protect the whole of the Indonesian people and their entire land". This statement enunciates the responsibility and obligation of the Indonesian State to protect its human resources and its environment. This provision is further defined in Article 33 of Paragraph (3) of the 1945 Constitution, establishing the principle of the management of the environment and natural resources.

> *"Land and water and the natural resources therein shall be controlled by the State and shall be utilized for the greatest welfare of the people".*

The main source of environment and natural resource management legislation in Indonesia is Law No.4 entitled "Basic Provisions for the Management of the Living Environment", which was enacted by the Parliament in March, 1982. These "Basic

[7] *This section except where otherwise noted is derived from Chua et al. (1997).*

Provisions" are the basis for relevant laws, regulations, presidential decrees, ministerial decrees/decisions, governor decrees, provincial regulations and detailed technical guidelines concerning the environment (Box 1). Indonesia has also signed and, in most cases, ratified relevant international conventions, such as the United Nations Conventions on the Law of the Sea (UNCLOS), the Biodiversity Convention, the Climate Change Convention and some IMO Shipping and Marine Pollution Conventions.

The development of nature conservation and protected areas is another important program in Indonesia that safeguards critical ecosystems, habitats and species for future generations. Indonesia has developed categories of protected areas ranging from very strict protection to more flexible approaches, which includes coastal and marine areas (Box 2).

Box 1. Partial List of Existing Rules and Regulations on Environmental and Natural Resources Management in Indonesia.

National Legislation
Act No.5 of 1967 on Forestry Principles
Act No.1 of 1973 on Indonesia's Continental Shelf
Act No.11 of 1974 on Water Resources Management
Act No.4 of 1982 on the Basic Provisions of Environmental Management
Act No.9 of 1985 on Fisheries
Act No 17 of 1985 on Ratification of UN Convention on the Law of the Sea
Act No.5 of 1990 on Conservation of Wild Natural Living Resources and Ecosystems
Act No.12 of 1992 on Cultivated Plants System
Act No.24 of 1992 on Spatial Planning
Act No.5 of 1994 on Ratification of UN Convention on Biodiversity
Act No.11 of 1994 on Navigation
Government Regulation No.28 of 1985 on Forest Protection
Government Regulation No.13 of 1994 on Hunting of Game Animal
Government Regulation No.20 of 1994 updated by Government Regulation No.12 of 1995 on Management of Hazardous Wastes
Presidential Decree No.43 of 1978 on Ratification Convention in International Trade of Endangered Species
Presidential Decree No.26 of 1989 on World Cultural and Natural Heritage
Presidential Decree No.23 of 1990 on the Establishment of Agency on Environment Impact Assessment (BAPEDAL)
Presidential Decree No.32 of 1990 on Management of Protected Area
Presidential Decree No.48 of 1991 on Ratification of Convention on Wetlands

Protection of Flora and Fauna
Ministerial Decree No.421 of 1970 on Protected Animals
Ministerial Decree No.54 of 1972 on Protected tree Species
Ministerial Decree No.251 of 1975 on Protection for Certain Tree Species and Seeds
Ministerial Decree No.903 of 1988 on Protected Forest
Ministerial Decree No.23 of 1994 on Monkey Species and Arowana Fish for Export Purposes

Source: Chua et al. (1997).

continued

Box 1. Partial List of Existing Rules and Regulations on Environmental and Natural Resources Management in Indonesia.

Water Resources Management and Development

Act No.11 of 1974 on Water Resources Development

Government Regulation No.22 of 1982 on waste Management Procedure

Mutual Decision of Ministry of Public Works with Ministry of Mining and Energy No. 076 K/101/MPE & No. 04/KPTS/1991 on the Use of Ground Water for Mining Activities

Decisions of the Director of Geology and Mineral Resources No. 392/526/060000/85 on Manual for Ground Water Management

Environmental Pollution and Environmental Quality

Government Regulation No.20, 1990 on Water Pollution Management

Decision No. 416/1990, Minister of Health on the Requirements and Monitoring on Water Quality

Decision No. 02P/101/MPE/1994, Minister of Mining and Energy, on Ground Water Management

Decision No. Kep-02/MENKLH/1988. State Minister for Population and Environment, on Environmental Standard for Liquid Waste Effluent

Decision No. Kep-03/MENLH/1991, State Minister for Population and Environment, on Environmental Standard for Liquid Waste Effluent

Decision No. Kep-13/MENLH/3/1995, State Minister of Environment, on Environmental Standard on Emission of Non-moving Facilities

Environmental Impact Assessment

Government Regulation No.5 of 1993 on Environmental Impact Assessment

No. Kep-12/MENLH/3/94, State Minister for Environment, on General Guidelines on the Environment Management and Environment Monitoring Programmes

Decision No. Kep-14/MENLH/3/94, State Minister for Environment, on General Guidelines on the Preparation of Environmental Impact Assessment

Decision No.103 K/008/MPE/1988, Minister of Mining and Energy, on the Technical Guidelines on the Preparation of Initial Environmental Assessment and Environment Impact Assessment, on General Mining, Oil and Natural Gas, and on Geothermal Energy

Decision No. 1158/008/NPE/1989, Minister of Mining and Energy on Environmental Impact Assessment on Activities Related to Mining and Energy

Decision No. 390/K/008/MPE/1995, Minister of Mining and Energy, on Technical Guidelines on Report Preparation of Environment Management and Environmental Monitoring Activities of Ground Water Extraction

Decision No.75/1994, Minister of Transportation on Technical Guidelines on Preparation of Environmental Impact Assessment on Ports, Decision No. KEPOS6/1994 Head of the Environmental Impact Agency on Criteria for Important Impacts.

Hazardous Waste Management

Decision No. 68/BAPEDAL/05/1995, Head of the Agency Environmental Impact Management Agency (BAPEDAL), on Procedure in Obtaining Permit on Transporting, Collecting, Operation of Processing Plan, Processing and Final Disposal of Hazardous and Toxic Wastes Disposal of Hazardous and toxic Wastes

Decision No. 01/BAPEDAL/09/1995, BAPEDAL, on Procedure and Technical Requirements on the Storage and Collection of Hazardous and Toxic Wastes

Decision No. 02/BAPEDAL/09/1995, BAPEDAL, on Document of Hazardous and Toxic Wastes

Decision No. 03/BAPEDAL/09/1995, BAPEDAL, on Technical Requirements on the Processing of Hazardous and Toxic Waste

Decision No. 04/BAPEDAL/09/1995, BAPEDAL, on Procedure and Requirements on the Dumping, and Site of Dumping Grounds for Processed Hazardous and Toxic Waste

Decision No. 05/BAPEDAL/09/1995, BAPEDAL, on Symbol and Label of Hazardous and Toxic Materials

Source: Chua et al. (1997).

continued

Box 1. Partial List of Existing Rules and Regulations on Environmental and Natural Resources Management in Indonesia (continued).

Indonesia's efforts to protect the marine environment have been strengthened by the ratification of many relevant international conventions, including:

International Convention for the Safety of Life at Sea (SOLAS), 1960 (ratified in 1966)
International Agreement for Facilitation of Search Ships in Distress and Rescue of Survivors of Ship Accident (ratified in 1976)
International Convention on Civil Liability for Oil Pollution Damage, 1969 (ratified in 1978)
International Convention on the Establishment of an International Fund for compensation for Oil Pollution Damage, 1971 (ratified in 1978).
Convention on the International Regulation for Preventing Collisions at Sea (CORLEG), 1972 (ratified in 1979).
International Convention for the Safety of Life at Sea (SOLAS), 1972 (ratified in 1980)
International Convention for Prevention of Pollution from Ships (MARPOL, Annexes I and H), 1973 and MARPOL Protocol 1978 (ratified in 1986).
International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978 (ratified in 1986)
SOLAS Protocol, 1978 (ratified in 1988)
Convention for Safe Containers (CSC), 1972 (ratified in 1989)
International Convention on Load Lines (LL), 1996 (ratified in 1976).

Source: Chua et al. (1997).

The Department of Forestry, in particular, the Director-General of Forest Protection and Nature Conservation (Ditjen PHPA), is the management authority for nature and conservation areas. The Office of the Ministry of Environment in cooperation with the Minister of the Department of Forestry is the policy-making body, and the Indonesian Institute of Sciences (LIPI) has been assigned as the scientific authority. The Ditjen PHPA has formulated the objectives, criteria for identification and selection, guidelines for development of short, medium and long term plans and priorities for the establishment of nature and conservation areas in Indonesia. The Riau Archipelago and the east coast of Sumatra are long term or third order priorities for development.

At present, there are 23 established marine reserves in Indonesia covering approximately 2.6 million hectares. This is far below the target area of 10 million hectares set as a goal for the end of REPELITA V, and 30 million hectares by the year 2000. By 1994, the end of REPELITA V, about 5.4 million hectares of marine conservation area had been studied. About 6.2 million hectares are planned for study in REPELITA VI (1995-1999), before being eligible to be officially declared as marine reserves, however, that represents only 62% of the medium term target. One of the serious problems facing the Ditjen PHPA is a shortage of adequately trained and motivated personnel to carry out this highly commendable but ambitious undertaking.

Pollution Control

In Indonesia, the agency responsible for resolving environment and development issues is the Office of the State Minister for Environment. It was established in 1978, on the

Box 2. Categories of Coastal and Marine Protected Areas in Indonesia.

Scientific Reserve/Strict Marine Reserve (Cagar Alam Laut) To protect nature and maintain the natural processes in an undisturbed state in order to have an ecologically representative example of the natural environment available for scientific study, environmental monitoring, and education, and for the maintenance of genetic resources in a dynamic and evolutionary state.

National Marine Park (Taman National Laut) To protect natural and scenic areas of national or international significance for scientific, educational, and recreational uses.

Natural Monument Marine Park (Taman Laut) To protect and preserve nationally significant natural features because of their special interest or unique characteristics, while enabling their controlled use for recreation, interpretation and education.

Managed Marine Reserve/Marine Sanctuary (Suaka Mar gastwa Laut) To assure the natural conditions necessary to protect nationally significant species, groups of species, biotic communities, or physical features of the environment, where these may require specific human manipulation for their perpetuation.

Protected Seascape (Taman Wisata Laut) To maintain nationally or provincially significant natural areas which are characteristic of the harmonious interaction of man with islands, coasts and sea, while providing opportunities for public enjoyment through recreation and tourism within the normal life-style and economic activity of these areas.

Resources Reserve (Suaka Sumberdaya Laut) To protect the natural resources of the area for future use, and prevent or contain development activities that could affect the resource pending the establishment of objectives which are based upon appropriate knowledge and planning.

Multiple Use Management Area/Managed Resources Area (Kawasan Sumberdaya Laut) To provide for the sustained production of timber, wildlife, fisheries and outdoor recreation, with the conservation of nature primarily oriented to the support of the economic activities (although specific zones may also be designed within these areas to achieve specific conservation objectives).

World Heritage Site To protect the natural features for which the area was considered to be of World Heritage quality, and to provide information for worldwide public enlightenment.

Source: Chua et al. (1997).

recommendation of the National Committee on Environment Protection (NCEP), an interdepartmental committee established in 1971. The function of the NCEP was to formulate national policies and to establish guidelines and priorities, and to conserve the quality of the environment without hindering economic growth. Three priority areas of concern were forest utilization, human settlement and marine pollution.

The present function of the State Minister for Environment is now much broader in scope. The Office of the Minister coordinates national efforts on environmental matters, including drafting of laws, regulations and the establishment of environmental standards. The Environment Ministry has received strong support from many government agencies, research institutions, universities and many national committees dealing with the environment. One such committee is the National Committee on the Marine and Coastal Environment. The principal functions of this National Committee are to prepare rules and regulations on the development and management of marine and coastal areas, to monitor pollution and to give advice to the Office of the Minister on Environment.

Table 14. Legislation and Regulations Pertinent to the Management of Coastal Pollution by Indonesia.

Legislation	Substance
A. Industrial Waste and Wastewater Pollution Control	
Public Water Law (1936)	Governs disposal of industrial wastes into public streams
Nuisance Ordinance (1926) (Amended 1940)	Industrial control standards and disposal of harmful wastes
Presidential Decree 7(1973)	Regulations of pesticide distribution; storage and use of pesticides
Ministry of Agriculture Directives (1973-1975)	Provisions to control water pollution in various water use situations in relation to public health
Environmental Management Act (1982)	Basic provisions for the management of the living environment
PROKASIH (1989)	Cleanup of rivers in various provinces
Government Regulation No.20/1990 -Control of Water Pollution	Introduces national quality standards; authorizes Governors to set local standards; provides for licensing and regulation of liquid waste generators; and specifies adminstrative and other sanctions
B. Sea Pollution Control	
Continental Shelf Act (1973)	Provisions for prevention of and combating pollution from exploration and exploitation, as well as scientific research on the countries continental shelf
Exclusive Economic Zone (EEZ) Act (1983)	Provisions for the prevention and combating marine environmental pollution from any activities of the EEZ in Indonesia
Act 17: Ratification of UNCLOS 82, Part XII (1985)	Apart form the provisions dealing with the protection and prevention of the marine environment , it also contains provisions for establishing oil spill contingency plans
Presidential Decree No. 46: Ratification of MARPOL 73/78 Annexes I and II	Issues regulations to implement MARPOL 73/78 Annexes I and II
Decree of the Directorate General of Sea Communications No. PY. 69/1/11-86 (31/10/86)	Deals with the supply of facilities for the prevention of pollution from ships
Decree of the Minister of Communication No. KM 215/AL/506/PHB-87 (19/09/87)	Deals with the 'Internaitonal Certificate for the Prevention of Waste from Petroleum and Poisonous Liquids'

Source: Chua et al. (1997).

continued

Table 14. Legislation and Regulations Pertinent to the Management of Coastal Pollution by Indonesia (continued).

Legislation	Substance
C. Control of Hazardous Waste	
Government Regulation No. 7/1973- Control for the Circulation, Storage and Use of Pesticides	Applies to matters as described in the heading
Government Regulation No. 13/1975- Transport of Radioactive Materials	Applies to matters as described in the heading
Regulation of the Minister of Health No. 453/MEN.KES/PER/XI/1983- Re Hazard Materials	License of controls by registration of the production, import and distribution of certain hazardous materials; prescribes standards for the transport of hazardous materials; and requires a license holder to record and report cases caused by hazardous materials under his management
Decree of Minister of Communications No. KM. 167/1986 - International Certificate on the Prevention of Oil Pollution and on the Prevention of Pollution from Liquid	Applies to mailers described in the title
D. Other Legislation With Environmental Relevance	
Act No.5 (1984) Government	Relates to pollution caused by industrial activities
Act No.9 (1985)	Relates to pollution caused by fisheries and aquaculture activities
Regulation No.51 (1993) -Environmental Impact Analysis	Applies to matters described in the heading

Source: Chua et al. (1997).

Indonesia has ample legislation concerning industrial waste and wastewater control (Box 1). Further, numerous regulations on water quality and effluents have been issued at the provincial level, primarily for major population centers such as Jakarta, Bandung, Surabaya and Jogiakarta.

The major oil spill caused by the *Showa Maru* accident on 6 January 1975 stimulated the government of Indonesia to establish Standard Operation Procedures (SOP) for oil spill response in the Straits of Malacca and Singapore. The SOP is a Joint Decree between the Directorate-General of Sea Communication and the Directorate-General of Oil and Gas, signed in 1981 (Joint Decree No. DKP/112127/ Kpts/ DM/ MIGASI 1981) in which the Directorate General of Sea Communication is the Coordinator and PERTAMINA, the state owned oil company, is the oil pollution equipment operator.

The government of Indonesia completed drafting a National Marine Oil Spill Contingency Plan in 1991 and awaits signing as a Presidential Decree. The primary responsibility remains with the Directorate General of Sea Communication. The Environmental

Impact Management Agency (BAPEDAL) is responsible for damage assessment and restoration of the environment to pre-spill conditions.

During the *MV Nagasaki Spirit* (1992) and *MV Sanko Honour* (1993) incidents, Indonesia activated its national plan. The national coordination was performed by the National Operation Center for Combating Oil Pollution (NOCOP) at the Head Office of the Directorate General of Sea Communication using the command, control, communication and information system of the Command and Control Post for the Maritime Safety Guard and Rescue System which operates 24 hours a day.

The Port Administrator of Belawan, North Sumatra was appointed as On-Scene Coordinator (OSC). He coordinated all the related agencies in the area. The Indonesian Navy sent aircraft and surface craft; the Police and Customs sent surface craft; and PERTAMINA sent surface craft and some of oil pollution clean-up equipment. The OSC also coordinated the salvage ships from Singapore, which rendered assistance during the incident and later towed the damaged ships.

The NOCOP coordinated the related agencies at the national and international levels including the navy, police, customs and PERTAMINA. The BAPEDAL and some other experts supported the NOCOP during the incidents. At the international level, there was coordination with the Director General of Environment of Malaysia, the Headquarters of the Indian Coast Guard, the owners of the ship and the salvage company.

Environmental Impact Assessment (EIA)

Foreign investors in Indonesia are required to meet increasingly stringent environmental requirements. Any application for approval of a foreign investment requires a preliminary environmental information report (penyajian informasi lingkungan (PEIL)). This is a standard document requiring a brief assessment of the proposed activity to be conducted, the location of the project site and potential negative and positive consequences. An environmental impact assessment (analisa pengenai dampak lingkungan (AMDAL)) analyzes the positive and negative impacts of a project and identifies and evaluates appropriate remedial actions. The Environmental Management Plan (PKL) and Environmental Monitoring Plan (RPL) prescribe design and operating requirements for mitigating environmentally harmful impacts and methods for measuring compliance.

Any major development project is required to have an environmental impact assessment before commencing construction. In order to determine whether an AMDAL is necessary, a preliminary PEIL must be completed by the proponent for submission to the Central AMDAL Commission or Regional AMDAL Commission. Despite this requirement, the implementation and enforcement of the AMDAL was still considered to be very weak.

To strengthen the enforcement of AMDAL, a series of regulations were prepared, including:

a. Government Regulation No.5/1993 on Environmental Impact Assessment;

b. Decision No. KEP-11/MENLH/3/94 on activities requiring AMDAL; and

c. Decision No. KEP-14/MENLH/3/94 on guidelines for the preparation of AMDAL.

The 1990 creation of the enforcement agency, BAPEDAL was a significant development for waste management in Indonesia. BAPEDAL is an integral part of the State Ministry for Environment and is involved in all aspects of environmental regulations, from the design and formulation of regulations and standards, to the investigation of potentially polluting activities, mediation of disputes between factories and communities claiming damages from effluents, and the negotiation of contracts defining standards for unregulated activities.

Presidential Decree No. 77 of 1994 strengthened, expanded and recognized BAPEDAL. Regional branches (BAPEDALDA-s), were then established. BAPEDAL is chaired by the State Minister of Environment but as a non-departmental government body, it is directly responsible to the President of Indonesia. Its main role is to assist the President in environmental impact control, which includes the prevention and control of environmental pollution, environmental deterioration, and the restoration of environment quality, in accordance with the prevailing statutes and regulations. BAPEDAL is expected to enhance the enforcement of AMDAL.

Lessons Learned

Although the legislative standards have not been fully developed, Indonesia has taken other measures to handle the disposal of human waste. Except for Bandung, Jogjakarta, and Medan which all have waste treatment plants and sewage systems in parts of the cities, septic tanks connected to seepage pits are widely used in most urban areas (Abu Bakar Jafaar and Valencia, 1985a). Additionally, the Department of Industry, in collaboration with the Department of Health, uses established technical guidelines to evaluate alternative waste disposal systems for industrial wastes (Karimoeddin, n.d.). Pesticides are comprehensively regulated in Indonesia[8].

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[8] *See Presidential Decree No. 7, 1973, concerning regulation of distribution, storage, and use of pesticides; Directive from the Minister of Agriculture No. 201/Kpts/Um/1973 concerning the application of procedures for pesticide registration and use approval; Directive from Minister of Agriculture No. 429/Kpts/Um/1973 concerning conditions for pesticide packaging and labeling; Directive from Minister of Agriculture No. 437/Kpts/Um/4/1975 concerning registration and approval of pesticide use; Directive from Minister of Agriculture No. 125/Kpts/4/1975 concerning registration and approval of pesticide use; Directive from Minister of Agriculture No. 201/Kpts/MP/5/1975 concerning directory of offices regulating distribution, storage and use of pesticides.*

Table 15. Long-Term Strategy and Step-by-Step Approaches for Environmental Management and Pollution Control in Indonesia.

Third Five Year Development Plan (1978-1983)	a. to enhance awareness of the public, government officials, private sector and industry on environmental issues, criteria and priorities; b. to generate coordination on environmental issues and problems among sectoral departments; c. to introduce environmental issues into the curriculum of grade school, secondary and high schools, and to create Centers for Study on Environment and Natural Resources Management at the post-secondary level; d. to formulate and pass the Basic Law on Environment; e. to collect and collate environmental data and information as a base f. to formulate more detailed and specific regulations; g. to encourage the establishment of NGOs specializing in environmental issues as working Partners with government
Fourth Five Year Development Plan (1984-1989)	a. to strengthen the existing cooperation and coordination among the sectoral departments to strengthen regional cooperation on environment, in particular with ASEAN countries b. to request support for national capacity building to international and regional donor agencies and through bilateral cooperation c. to prepare government and sectoral rules and regulations on specific environment problems d. to create an Environmental Impact Management Agency (BAPEDAL) as an arm of the Office of the State Ministry to manage impact assessment and pollution control and e. branches at the regional level (BAPEDALWIL,) and at the provincial level (BAPEDALDA) as well as environment in various sectors and provinces a to prepare a status report on the environment in Indonesia
Fifth Five Year Development Plan (1989-1994)	a. to prepare various Action Plans, e.g., on Biodiversity, Coral Reef, Mangroves, etc b. to strengthen BAPEDAL and BAPEDALDA (Provincial), start to educate, inform and c. consult industries, government officials and judges on the existing rules and regulation to launch PROKASIH (Clean River Program) in a number of provinces, d. to monitor an evaluate PROKASIH e. to enforce the rules and regulation
Sixth Five Year Development Plan (1993-1998)	a. to enhance the effectiveness of water pollution control and give more authority to BAPEDALDA; b. to establish major treatment plants for industrial wastewaters such as Jakarta Greater Metropolitan, Surabaya, East Kalimantan and Lhokseumawe; c. to establish wastewater treatment plants in various cities such as Medan Batam, and Bandung; d. to establish more facilities for solid waste disposal and incineration; e. to acquire environment friendly technologies; f. to offer economic incentives for cleaner industries; g. to enforce environmental quality and pollution control standards; h. to green and beautify cities and river systems; i. to establish and strengthen infrastructures and facilities for marine pollution abatement, with special emphasis on oil pollution on major tanker routes seaports (Medan and Batam on the east coast of Sumatra .

Source: Chua et al. (1997).

Indonesia has the most detailed legislative and regulatory provisions among the Straits States for dealing with oil pollution arising from offshore exploration and exploitation activities[9]. The anti-pollution supervisory unit within the Oil and Natural Gas Directorate of the Department of Mining is responsible for the enforcement of these provisions (Johnston, 1980). Oil pollution research is being done by a study group on pollution at the Institute of Oil and Gas and the State oil company, PERTAMINA. The company also coordinates all activities connected with oil pollution.

There are no provisions for mandatory environmental impact assessment for offshore exploration and exploitation activities. Futhermore, little has been done to develop a system of civil liability for oil pollution damage resulting from these activities (Abu Bakar Jaafar and Valencia, 1985a). The apparent policy of the Indonesian government is that marine pollution by oil originating from offshore operations should not be covered by international conventions. The Indonesian government believes that such matters are of purely national concern and should be dealt with by the public authorities and the concerned oil companies (Abu Bakar Jaafar and Valencia, 1985a). On the other hand, Indonesia has introduced laws, regulations, and rules for controlling the transport and use of radioactive isotopes, and for preventing the danger of associated radiation[10].

Indonesia did ratify MARP0L 73/78 in 1986 and has issued legislation to implement it. However, Indonesia also declared at the time of ratification that it did not accept Annexes III and IV of the Convention. Otherwise, Indonesia has done little to control vessels which pollute its waters, other than introducing a specific regulation through the City of Jakarta (see Regulation No Bd. 15/4/36/70 L.D. No. 19 (1970) to prohibit the discharge of oil from tankers into waters around the Thousand Islands (Gugusan Kepulauan Seribu).

Malaysia

Legislative Framework

Malaysia has a quite comprehensive legislative framework for regulation of waste releases from land-based sources (Table 16), however, it has yet to develop a complete set

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[9] *The earlier legislative measures against pollution were through the enforcement of the following laws and regulations: The Storage of oil Ordinance of 1927; The Mine Policy Regulations of 1920; and The Basic Mine Law of 1967. The later provisions are Presidential Decree No.17, 1974, concerning regulation of offshore oil and gas exploration and exploitation (LN No.20, 1974, TLN No.3031); and Directive from Minister of Mines No. 04/P/M/ Pertamb/1973, concerning prevention and control of water pollution arising from exploration and/or exploitation of oil and gas activities.*

[10] *Law No.31 of 19694 concerning the basic decision for the development of atomic energy (LN No.124 of 1964); Presidential Decree No.33 of 1965 concerning the Atomic Energy Assembly and the National Atomic Energy Board (LN No.88 of 1965); and Presidential Decree No.5 of 1969 concerning the use of radioactive isotopes and radiation (LN No.18 of 1969, TLN No.2892). There is no mention, however, of how the used radioisotopes are to be handled.*

of regulations for controlling wastes flowing directly into the marine environment. Malaysia's Environmental Quality Act of 1974 (EQA) is the major piece of environmental legislation regulating releases of wastes from all sources except those of mining, offshore exploration and exploitation, agriculture, logging and earthworks. Its main principle is that no person, unless licensed, may emit, discharge or deposit waste including oil or mixtures containing oil into any inland waters or Malaysian waters in the contravention of established laws and regulations. Licenses to permit contravention of laws and regulations may be granted in limited circumstances. The environmental pollution control regulations gazetted under the EQA are listed in Box 3. Under the Act, three sets of waste regulations, were introduced — for palm oil factories, natural rubber processing plants, and sewage and other onshore manufacturing industries (see Table 16). Waste disposal from mining operations is regulated by State authorities but relegated to the Federal Department of Mines[11].

The control of silt and sediment due to soil erosion and runoff is obtained by four separate laws. The Land Conservation Act has been adopted throughout Peninsular Malaysia. The Act seems, however, to have been virtually without effect thus far because it vests broad discretion in State authorities to declare whether a given tract of land should be cleared or planted with short-term crops (Shane, 1977). The Local Government Act of 1976 also has provisions for local authorities to prohibit certain discharges within their areas of jurisdiction. In addition, the Street, Drainage, and Building Act of 1974 empowers the authorities to issue city bylaws for the control of silt washed away due to improper drainage and improper maintenance of streets (Abu Bakar Jafaar and Valencia, 1985a).

Proper drainage and frequent maintenance of logging tracks are some of the practices required in accordance with various forests enactments enforced by respective state authorities. Also, in accordance with the waters enactment, the state authorities can alienate sufficient riparian reserves to prevent silt input to streams and rivers (Rashid, 1981).

The Pesticides Act of 1974 provides for the regulation of the import, manufacture, sale and storage of pesticides but has no provision for regulating their use (Shane, 1977). In practice, however, the various state authorities can prohibit the use of certain pesticides which directly affect the beneficial uses of any inland waters, subterranean water resources, and any water in an estuary or sea adjacent to the coast of their respective jurisdictions[12]. For instance, the State of Perak has banned the use of sodium arsenite as a herbicide (Abu Bakar Jafaar and Valencia, 1985a).

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[11] This is in accordance with the Mining Enactment —Federated Malay States (FMS) Ch. 147 (1929) and its counterpart state legislation. As a matter of practice, effluent limitations in terms of suspended solid content not to exceed 800 grains per imperial gallon (or equivalent to 11.320 parts per million, (ppm) or grain size not to exceed 150 mesh are specified as conditions set forth in mining leases issued by state authorities following consultation with the Drainage and Irrigation Department and the Mines Department.

[12] This State's provision appears principally as a new section (Section 7A) of the Waters (amendment) Enactment of 1970.

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Table 16. Malaysia Legislation and Regulations Pertinent to the Management of Coastal Pollution.

Legislation	Substance
A. Industrial Waste and Waste Water Pollution Control	
Mining Enactment 146/147 (1929)	Control of effluent waters from mining
Land Conservation Act (1960)	Control of silt and erosion resulting from land-use activities
Waters Enactment Act (1920) Amended (1970)	Control of river and water pollution
Street, Drainage and Building Act (1974)	Regulations to control discharges of trade effluent and domestic wastes into rivers; control of earthworks
Local Government Act (1974)	Regulations to prohibit steam pollution and to provide sanitary service.
Rearing of Pigs Enactments: Province of Wellesley Piggery By-Laws (1956), Johore (1975), Trengganu (1976), Malacca and Negeri Sembilan (1980), Selangor (1984)	Requires treatment of pig wastes before discharge.
Environmental Quality (Licensing) Regulations (1977)	Provides licensing regulations for environmental and pollution control
Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations (1977)	Provides regulations for environmental and pollution controls
Environmental Quality (Prescribed Premises) (Crude Natural Rubber Regulations (1978)	Provides regulations to control the environment on the premises of natural rubber processing areas
nvironmental Quality (Sewage and Industrial Effluents) Regulations (1979)	Provides regulations to control discharges of sewage and industrial effluents
Environmental Quality Act (1974) (Amended 1985, 1996)	Environmental impact assessment, licenses for polluting activities (land, air and noise) with regulations for crude palm oil, raw natural rubber, sewage and industrial effluent Section 26 (deleted by Act A636, 1985 Amendments:) a. Meant for the prevention of spills or discharges of oil or a mixture containing oil in EEZ and on Continental Shelf if such spillage would result in those substances being dispersed into Malaysian waters b. Duplication with EEZ Act 1984, Merchant Shipping Ordinance 1952 and Merchant Shipping (Oil Pollution) Act 1994
	If the Amendments have not been enforced, the duplication will still persist.
	Section 27. Prohibition of discharge of oil into Malaysian waters (Amendments 1996: maximum fine RM5000,000 or 5 years imprisonment or both) .
	Section 29. Prohibition of discharge of wastes into Malaysian waters (Amendment 1996: maximum fine RM500,000 or 5 years imprisonment or both).
	Section 47. Power of recovery of costs and expenses .
	Section 48. Power to detain and sell the ship.
	The 1996 amendments increased the fines and incarceration times for violations.

Revised from Chua et al. (1977).

continued

Table 16. Malaysia Legislation and Regulations Pertinent to the Management of Coastal Pollution (continued).

Legislation	Substance
B. Sea Pollution Control	
Fisheries Act (1963)	Regulation to protect fishery and fish farming activities in marine and estuarine waters and the environment
Forestry Act (1984)	Regulations to prohibit water pollution in forest reserves including coastal forests
National Exclusive Economic Zone Act (EBZ Act) (1984)	Part IV of the Act covers the protection and preservation of the marine environment of the zone beyond the territorial sea out to 200 nautical miles.
Merchant Shipping Act (Oil Pollution) (1993)	Provides regulations to enforce the provisions in the IMO's CLC and Fund Conventions.
C. Control or Hazardous Water	
Atomic Energy Licensing Act (1984)	Prohibition of unauthorized disposal of radioactive waste.
Environmental Quality (Scheduled Wastes) Regulations (1989)	Regulations to control handling of scheduled wastes.
Environmental Quality (Prescribed Premises) Scheduled Waste Treatment and Disposal Facilities Order (1989)	Regulations for the treatment and disposal of scheduled wastes.
Environmental Quality(Prescribed Premises -Scheduled Waste Treatment and Disposal Facilities) Regulations (1989)	Provides facility requirements for the treatment and disposal of scheduled wastes

Revised from Chua et al. (1997).

For controlling pollution arising from offshore exploration or exploitation activities, the Petroleum Mining Act of 1966 empowers PETRONAS, the national Petroleum Authority, to specify conditions in any exploration license. The conditions provide that the licensee shall take all steps practicable to prevent the escape of oil or waste of petroleum discovered in the exploration area[13]. Although there is no legal requirement for stipulated oil content level in the effluent from the offshore platforms, standard industrial practice in other parts of the world has been adopted and imposed by PETRONAS[14].

Control of Domestic Sewage/Wastewater

Management of domestic sewage or industrial wastewater is now controlled by the Environmental Quality (Sewage and Industrial Effluents) Regulations of 1979. Previously, management of the sewerage systems was the responsibility of various local authorities throughout the country. Little attention was given to the operation and maintenance of these

[13] *Revised in 1972, L.M. Act 95, in accordance with its section 7(5).*

[14] *The set limit for oil is 50 ppm, the level that is considered achievable and acceptable in Malaysia (Lau, 1980).*

Table 17. Environmental Pollution Control Regulations Gazetted under the Environmental Quality Act (EQA) 1974 and EQA Amendments, 1985.

	Regulation/Order	Effective Enforcement Date
1.	Environmental Quality (Prescribed Premises) (Crude Palm Oil) Order 1977, P.U.(A) 199.	July 1, 1978
2.	Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations 1977 Amendment (1982), P.U.(A) 342.	November 4, 1997
3.	Environmental Quality (Licensing) Regulations 1977 P.U. (A) 198	October 1, 1977
4.	Motor Vehicle (Control of Smoke and Gas Emissions) Rules 1977 (made under the Road Traffic Ordinance, 1958), P.U.(A) 414.	December 22, 1977
5.	Environmental Quality (Prescribed Premises) (Raw Natural Rubber) (Amendment) Order 1974, P.U.(A) 337.	April 1, 1979
6.	Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations 1978 Amendment (1980), P.U.(A) 338.	December 1, 1978
7.	Environmental Quality (Clean Air) Regulations 1978, P.U.(A) 280.	October 1, 1978
8.	Environmental Quality (Compounding of Offenses) Regulations 1978, P.U.(A) 281.	October 1, 1978
9.	Environmental Quality (Sewage and Industrial Effluents) Regulations 1979, P.U.(A) 12	January 1, 1979
10.	Environmental Quality (Control of Lead Concentration in Motor Gasoline) Regulations 1985, P.U.(A) 296.	July 11, 1979
11.	Environmental Quality (Motor Vehicle Noise) Regulations 1987. P.U.(A) 244.	July 16, 1987
12.	Environmental Quality (Prescribed Activities) Environmental Impact Assessment) Order 1987, P.U.(A) 362. Section 34A. Report on impact on environment resulting from prescribed activities. Preventive measures can be instituted to control oil and grease pollution of the marine environment caused by a number of prescribed activities, such as: a. construction of a product depot for storage of petrol or diesel above 60,00 barrels b. shipyards with capacities above 500 tonnes c. construction of offshore and onshore pipelines of 50 km and above d. construction of petrochemical industries and oil refineries of any size e. construction of new ports and port expansion involving an increase of 50 percent handling capacity per annum f. oil and gas field development	April 1, 1988
13.	Environmental Quality (Scheduled Wastes) Regulations 1989, P.U.(A) 139.	May 1, 1989
14.	Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Order 1989, P.U.(A) 140.	May 1, 1989
15.	Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Order 1989, P.U.(A) 141.	May 1, 1989

Revised from Chua et al. (1997).

facilities resulting in many systems not performing up to the health and environmental standards. Realizing the urgent need to accelerate the development program for upgrading and extending the sewerage service, the Malaysian Government has awarded a concession to a private consortium to undertake a nation wide sewerage development program over the next 18 years for 145 population centers.

Control of Industrial and Agriculture Waste

To enforce compliance with various standards of discharge either directly into watercourses or into land, the DOE adopted a licensing system (Koe and Aziz, 1995:117). Several types of licenses are issued by the DOE. A typical example is the annual license for prescribed premises provided for under Section 18(1) of the Environmental Quality Act EQA). Palm oil and natural rubber processing mills are required to comply with the standards of discharges specified under the Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations of 1977 (Amended 1982) and the Environmental Quality (Prescribed Premises - Raw Natural Rubber) Regulations of 1978 (Amended 1980), respectively. Another type of license is issued for the manufacturing sector under Section 25(1) of the EQA. The licenses are issued to enforce discharge standards in the Environmental Quality (Sewage and Industrial Effluents) Regulations of 1979.

Marine Pollution Control

Malaysia has recently ratified MARPOL 73/78. However, it has not ratified Annexes III and IV because it lacks the waste disposal and reception facilities required to implement them. Nevertheless, there is a series of domestic legislation dealing with marine pollution control. For example, the Merchant Shipping Ordinance (MSO) of 1952 (Amended 1991) gives broad powers to the Director of Marine (DM) to take action to prevent or reduce the extent of pollution through the escape of oil and other harmful substances. In the event of an oil spill or a threat of any pollution, the DM may sink or destroy the ship or cargo (section 306I) and any expenses incurred shall be a debt due to the Government (Section 306G); or detain a vessel (Section 504-507).

Also the Exclusive Economic Zone Act (EEZ Act) 1984 stipulates the following.

a. If any oil, mixture containing oil or pollutant is discharged or escapes into the EEZ from any vessels, land-based source, installation or other device, the relevant person has committed an offense (subject to limited defenses) and is liable to a fine of up to RM1,000,000.

b. The authority ‘may issue directions as “necessary” to remove, disperse, destroy or mitigate damage or threat of damage as a result of the discharge of a pollutant. The persons responsible for the relevant discharge (owner and master of the vessel, the

owner or occupier of the place on land, or owner and person in charge of the installation or device) are jointly and severally liable for the cost of work to remove, disperse or mitigate pollution. That cost constitutes a charge on the property or interest held by the relevant person.

c. An owner or occupier of land, a shipowner and master of a vessel, or owner and person in charge of an installation or device (as applicable), is liable for damage to the environment within the EEZ or continental shelf caused by the discharge or escape of oil, mixture containing oil or other pollutant. The authority may detain any vessel from which the pollutant escaped.

A National Oil Spill Contingency Plan is supported by the Petroleum Association of Malaysia Mutal Aid Group. This initiative is subscribed to by companies involved in downstream processing and upstream production of petroleum in Malaysia. Its objectives are to complement the National Oil Spill Contingency Plan while providing its members with immediate response in case of oil spills.

Control of Hazardous Waste

A survey conducted by the DOE in 1984 had found that about 280,000 m^3 of hazardous waste was being generated by industry, mostly from the metal finishing and electroplating, chemical, electronic and electrical, printing and packaging industries. Regulations for management of hazardous waste were gazetted in April 1989 and included:

a. Environmental Quality (Scheduled Wastes) Regulations, 1989;

b. Environmental Quality (Prescribed Premises) (Scheduled Waste Treatment and Disposal Facilities) Regulations, 1989; and

c. Environmental Quality (Scheduled Wastes) (Treatment and Disposal Facilities) Order, 1989.

Some 107 categories of toxic and hazardous wastes were defined as “scheduled wastes” under the Environmental Quality (Scheduled Wastes) Regulation of 1989. Under the Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Order of 1989, six types of premises were described for which their occupation and use requires written permission and a license from the DOE. The premises are as follows:

a. land treatment facilities, such as sludge farms;

b. offsite recovery facilities;

c. offsite treatment facilities, such as centralized physical/chemical wastewatertreatment plants;

d. scheduled waste incinerators;

e. offsite storage facilities, including transport vehicles; and

f. secure landfills designated for the disposal of scheduled wastes.

The above premises (except land farming facilities) must also comply with the requirements of the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order of 1987, which requires an EIA to be conducted. The EIA report must be submitted to the Director-General of the Department of Environment before construction activities are carried out. Procedures for license applications, renewals and ownership transfers, requirements for record keeping, and submissions to the DOE are specified under the Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Regulations of 1989. Offenders can be prosecuted in court and, if found guilty, the maximum penalty is RM10,000 or 2 years imprisonment, or both. A fine of RM1,000 per day for every day the offense is committed is also prescribed.

Currently, there are no comprehensive hazardous waste treatment and disposal facilities in Malaysia. Rather, there are many garbage disposal sites scattered all over the country, which also accept industrial wastes. But none of these sites are suitable for the disposal of toxic and hazardous wastes because of poor siting, unsuitable geological characteristics of the soil and poor management.

Radioactive waste disposal is not totally prohibited under the sewage and industrial effluents regulations because its limits are yet to be specified by the minister in charge of the environment (Environmental Quality Act of 1974). Under the Radioactive Substances Act, however, the Minister of Health is the authority in charge of regulating most aspects of the manufacture, storage, sale and use of radioactive substances and their safe disposal of radioactive wastes.[15] In 1993, guidelines for the handling, storage, transport and disposal of hazardous waste were drawn up by a Task Force on Toxic and Hazardous Waste convened by the DOE.

Environmental Impact Assessment (EIA)

A person who intends to carry out a prescribed development must submit a report to the Director-General of the Department of Environment. The report must contain an assessment

[15] *These rides are known as the Radiation Protection Rules of 1974.*

of the impact that the activity will have or is likely to have on the environment, and proposed measures to prevent, reduce or control the adverse impact on the environment. The Government is taking steps to standardize and simplify the procedures for preparing EIA reports to "minimize delays in approving the reports for new projects". The objective will be accomplished in part by introducing mandatory formats for EIA reports. Standard formats will be developed for each type of economic activity, such as petroleum-related industries.

Box 3. List of the "Prescribed Activities" in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987.

1. Agriculture
2. Airport
3. Drainage and irrigation
4. Land reclamation
5. Fisheries
6. Forestry
7. Housing
8. Industry
9. Infrastructure
10. Ports
11. Mining
12. Petroleum
13. Power generation and transmission
14. Quarries
15. Railways
16. Transportation
17. Resort and recreation development
18. Waste treatment and disposal
19. Water supply

Source: Chua et al. (1997).

The prescribed activities requiring EIA reports under the Environmental Quality prescribed Activities) (Environmental Impact Assessment) Order of 1987 are listed in Box 3.

Lessons Learned (Hamzah and Basiron, 1996)

a. The EQA does not comprehensively protect the marine environment from all categories of hazardous waste.

b. Detection and prosecution of polluters are difficult because most discharges are discrete events.

c. Enforcement is hampered by the broad distribution of non-point land-based sources.

d. The EQA does not give the DOE sufficient legal authority to deal with synergistic effects of mixed discharges or wastes in rivers.

e. The marine water quality monitoring system does not allow comparison between sites and samples.

f. The proposed Interim Standard for Marine Water Quality is not enforceable, therefore denying the DOE the legal powers to prosecute violators.

g. Although local governments are empowered to enact legislation to control land development, many have neither the capacity to promulgate nor implement such laws

h. Local authorities should play a greater role in controlling the dumping of domestic sewage and solid waste. Better sanitary services and sewage treatment facilities are needed in areas adjacent to the Malacca Straits.

i. The *Nagasaki Spirit* incident revealed some weaknesses in communications and co-ordination, as well as in the timely accuracy of spill trajectory predictions

j. Piggeries should be relocated away from rivers and treatment of waste before discharge should be mandatory.

Suggestions

The DOE has been effectively enforcing Section 27 of the EQA within the limits of Malaysian territorial waters with the assistance of other marine related agencies. Nevertheless, much remains to be done.

a. Malaysia should ratify the remaining relevant international conventions as soon as practical.

b. The Marine Shipping Ordiance should be used for the enforcement of vessel-based pollution rather than the EQA. The Marine Department should have a marine pollution division and the Ministry of Transport should take responsibility for the control and prevention of pollution from the transport industry.

c. Regulations with respect to the dumping of wastes, the rules for reception facilities under section 445(s), and the control of discharge of vessel residues, sewage or garbage under section 445(t) should be drawn up in line with MARPOL Annexes I, II, III, and V.

d. The Marine Department may not have sufficient qualified personnel for the effective implementation of all regulations. Thus, it should seriously consider delegating its powers of enforcement to other agencies such as the Ports, Fisheries, PETRONAS and the Navy.

e. The Ministry of Transport (MOT), Marine Department and the DOE should coordinate their individual roles and the actions to be taken collectively and established guidelines on combating oil spill or for oil pollution prevention.

f. The roles of the Director of Marine and the State Directors of Ports and Harbours (such as Sabah and Sarawak) should be better coordinated.

g. The penalties and limitations on liability should be reviewed and updated.

h. The International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC), 1990 requires littoral States bordering high-risk areas to have an adequate number of response centers and to preposition oil spill combat equipment. The relevant agencies should implement OPRC and incorporate provisions for the mandatory setting up of contingency plans by ports, vessels and offshore structures. The DOE and MOT should work together to ratify OPRC.

i. For the privatized port operators, the contracts should ensure that there is no pollution within the ports limits. This may be incorporated in legislation under the Ports Privatization Act, which may include the following:

    1. loading, unloading, cleaning of tanks, ballasting and deballasting operations do not result in pollution;

    2. EIA for dredging activity and the dumping of dredged material;

    3. Provision of sludge treatment and reception facilities; and

    4. Contingency plans and stockpiling of equipment to combat any untoward event within port limits.

j. The MOT, Port Authorities and the Marine Department should institute appropriate rules and regulations under the Port Authorities Act (PAA) of 1963; Port Privatization Act (PPA) 1990; and Federal Port Rules (FPR) of 1953;

k. All ports should provide reception facilities to vessels for oily waste and sludges, chemical material and garbage disposal and a fee should be charged to the users.

l. All ports should institute localized contingency plans to cater for any eventuality of oil and chemical spills.

m. Dredging and dumping of dredged material should adhere to EIA requirements.

n. Marine water quality criteria and standards for the protection of the marine fishery resources and marine parks are needed and regulations are necessary under the Fisheries Act of 1985 to ensure that the marine water quality standards can be maintained.

o. Fishing vessels licensed under the Act should be required to control the disposal of engine oil.

p. The DOE should require comprehensive feedback on the implementation of the

stipulated conditions in order to assess the trends and impacts of oil and gas activities on the marine environment.

q. Regulations are needed or under the EEZ Act for the protection and preservation of the marine environment.

r. The DOE and the relevant authorities should establish standing rules or guidelines for the inclusions of such regulations in licenses or agreements.

s. PETRONAS should consult the DOE on the licensing conditions to be imposed before any mining license is granted.

t. The relevant parts of the EQA should be extended to cover the EEZ and the powers of enforcement delegated to Fisheries or the Navy.

Singapore

Legislative Framework

Because of its small size and limited natural resource base (Abu Bakar Jafaar and Valencia, 1985a), Singapore does not need to develop pollution control laws to the extent of its neighbors. However, Singapore has been very effective, in controlling pollution in and into its waters. It was one of the first countries in the region to attempt to control marine pollution before attempting to control land-based pollution (Abu Bakar Jafaar and Valencia, 1985a). Singapore's response to the dangers of ship-generated pollution is perhaps the most comprehensive of the three states. By implementing its Prevention of Pollution of the Sea Act of 1971, Singapore has in effect ratified the 1954 International Convention for the Prevention of Pollution of the Sea by Oil (MARPOL 54). The later amendments to this Convention (MARPOL 69) are effected by its Civil Liability (Oil Pollution) Act of 1973 (Science Council of Singapore, 1980)[16].

The Ministry of the Environment (ENV) is planning to enact a new environmental law that will contain new guidelines for companies in the oil and petrochemical sector. The new legislation will 'merge' Singapore's pollution laws into a single statute, and introduce provisions requiring all oil and petrochemical companies to have standardized safety and audit systems in processing facilities and warehouses.

Industrial Waste and Wastewater Pollution Control

Industrial pollution control regulations include the Water Pollution Control and Drainage Act (WPA) of 1985, and the Environmental Public Health Act (EPA) 1988. The

[16] *The Maritime and Port Authority provides facilities for the reception, treatment and disposal of slops, sludges, dirty ballast and tank washing at the Slop and Sludge Reception and Treatment Center on Pulau Sebarok.*

Trade Effluent Regulations of 1976 under the WPA regulate the manner and the locations of effluent discharges, including discharges into public sewers. These Regulations require industrial wastewaters to be treated to prescribed standards prior to discharge.

Marine Pollution Control

The Prevention of Pollution of the Sea Act (PPA) of 1990 gives effect to MARPOL 73/78. It provides that if refuse, garbage, waste, marine pollutants, trade effluents, oil or an oily mixture is discharged into areas to which the PPA applies, the owner of the ship or facility is liable for the cost of measures taken to eliminate or reduce the damage. Penalties for unauthorized discharge of waste and oil range from S$500 to S$500,000 and/or two years imprisonment of the master, owner and agent. Additional remedies apply to a vessel from which pollutants have been discharged, including detention.

Although Singapore has ratified the International Convention on Civil Liability for Oil Pollution Damage, 1969 (CLC 69), it is not a member of the 1971 International Oil Pollution Compensation (IOPC) Fund, which provides extra funds to pay for tanker accidents (Hand, 20 October 1997). The total sum of money available to victims of the *Orapin Global* accident in Singapore through the convention is therefore restricted to around US$13 million. On 18 September 1997, Singapore became a party to the Protocol 1992 to the 1969 Convention on Civil Liability, which came into force on May 30, 1996, and raises available compensation from $28 million to $118 million. However, the Protocol will not enter into force in Singapore until 18 September the following year. As with CLC 69, the Protocol adopts the principle of strict liability for oil pollution. Tanker owners are required to arrange liability insurance for pollution damage caused by oil spills.

The relevant Singapore Ministries overseeing accidents in coastal waters include: the Ministry of the Environment (ENV), the Maritime and Port Authority (MPA), the Singapore Civil Defence Force, the Singapore Armed Forces and the Public Utilities Board. Overall, pollution control is well managed, but problems are possible arising from Singapore's fast developing environmental technologies industry.

Singapore's Emergency Response Plan for oil spills on land and sea involves the ENV, the Public Utilities Board; the Singapore Civil Defence Force, the Singapore Armed Forces and MPA. East Asia Response Limited (EARL) and Sembawang Shipyard Services are private companies with oil spill response teams that can be called upon to manage and contain spills outside port limits.

Box 4. Present Treatment Facilities in Singapore.

oil interceptors (820)
balancing tanks (2%)
sedimentation tanks (188)
neutralization tanks (187)
chemical tanks (458)
activated sludge oxidation tanks (10)
biological filtration tanks (15)
ion exchangers (1)
activated carbon adsorption tanks (10)

The treatment facilities in Singapore is presented in Box 4.

Control of Hazardous Waste

Both the EPA and the WPA regulate hazardous waste. The Environmental Public Health (Toxic Industrial Waste) Regulations of 1988 require a toxic waste generator to comply with specified storage, handling, transport, reporting and notification obligations in relation to that waste.

The Petroleum Act regulates the impact, storage and transport of petroleum substances on land, territorial sea and inland waters. It requires licenses to be obtained for specified quantities of petroleum and in specified locations. It also imposes conditions on the import, transport and storage of petroleum on land and marine areas within Singapore's jurisdiction, including its inland waters.

Singapore has the most effective measures in the region for regulating wastes that reach the marine environment (Abu Bakar Jafaar and Valencia, 1985a). Its sewage treatment program is illustrative. The sewage is treated at the Sewerage Department's treatment works before discharge into the sea. A portion of the effluent from the Ulu Pandan Treatment Works is further upgraded by the Jurong Industrial Works to provide industrial processing water to certain factories in the Jurong industrial area. The department also encourages the siting of new factories in areas where public sewers are available because it is less costly to discharge into public sewers than directly into watercourses (Science Council of Singapore, 1980).

In Singapore, the amount of wastes from land-based sources, which finally reach the ocean, is regulated by the Director of Water Pollution Control and Drainage of the Sewerage Department [17]. In addition, Singapore has imposed restrictions on the marine transportation of radioactive materials under its Radiation Protection Act of 1973. The Act provides for the regulation and control of the importation, manufacture, sale, disposal, transport, storage and use of radioactive materials and irradiating apparatus (Science Council of Singapore, 1980)[18].

With a narrow strip of territorial waters, Singapore has little prospect of discovering oil and gas offshore and thus no need for pollution regulations in this regard. Singapore is actively engaged, however, in near-shore excavation and coastal-land reclamation. But apparently, there are no environmental regulations governing these activities.

All three Straits states have ambitious programs of action to control land-based sources of pollution (Table 18). Indonesia and Malaysia are focusing on water quality assessment and monitoring, waste and silt discharge, capacity building and pubic education. Singapore

[17] *A maximum fine of S$5,000 may be imposed for the discharge into a watercourse of industrial effluent or treated sewage which does not meet the minimum standard of quality specified in the Trade Effluent Regulations of 1976. Also, the discharged effluents must not contain pesticides or radioactive materials.*

[18] *The Act is now administered by the Radiation Protection Department of the Ministry of Science and Technology.*

Table 18. Singapore Legislation and Enforcement Pertinent to the Management of Coastal Pollution.

Legislation	Substance
A. Industrial Waste andWastewater Pollution Control	
Water Pollution Control and Drainage Act (1975)	Control of effluent discharges from industrial, commercial, domestic and agricultural sources.
Trade Effluent Regulations (1976) (Amended 1977)	Control of trade effluent discharges into sewers and watercourses.
Environmental Public Health Act (1978)	Control of solid waste dumping.
B. Sea Pollution Control	
Prevention of Pollution of the Sea Act (1971) (Amended 1981)	Control of oil pollution and other contaminants discharged into rivers and seas.
Civil Liability (oil Pollution) Act (1973)	The Act was passed to give effect to IMO's Civil Liability Convention, 1969, which Singapore acceded to in 1981.
Singapore Port Regulations (1977)	Protection of the harbor environment.
Prevention of Pollution of the Sea Act (1990)	The Act came into force on 1 February 1991 in order to give effect to implementing provisions of MARPOL 73/78 which Singapore acceded to on 1 November 1990. The Act consists of six sets of subsidiary regulations to cover the following: oil, noxious liquid substances, reporting of pollution incidents, reception facilities, dispersants and equipment and composition of offenses. Under section 7(1) of the Act, the master, owner and agent of the ship shall each be guilty of an offence and each liable on conviction to a fine not less than $500 and not more than $500,000 or to imprisonment for a term not exceeding 2 years or both.
C. Control of Hazardous Waste	
Poisons (Hazardous Substances) Rules (1986)	Regulations to control the possession, storage, handling and disposal of poisonous substances.
Environmental Public Health Act (Toxic Industrial Waste Regulations) (1988)	Specifies in detail the regulations for storage, handling, transport, reporting and notification obligations in relation to toxic wastes.

Modified from Chua et al. (1997).

is more concerned with building environmental consciousness, upgrading environmental management and adopting clean technologies.

REGIONAL COOPERATION

Development of An Oil Spill Response Capability (Soentoro, 1994)

ASEAN Council on Petrolem

The ASEAN Council on Petroleum (ASCOPE) was formed in 1975 to promote and extend cooperation among state oil companies/agencies in each ASEAN country. The council consists of the heads of each national company/agency. Its impetus was the 1973 oil crisis and thus an emergency petroleum sharing scheme was its first priority. Its major thrust was the priority provision of oil by ASEAN producers to ASEAN consumers during times of worldwide shortage, and the priority purchase of oil by consumers from producers during a glut. However, data and technology exchanges and joint training programs soon followed, becoming more comprehensive every year. ASCOPE sponsors an annual technical conference which has become the nexus of oil and gas discussions in the region. And ASCOPE laid the groundwork for an ASEAN Committee on Energy comprised of the Ministers of Energy of each country, which pursues technical and policy cooperation. ASCOPE has initiated programs relating to the control and mitigation of marine pollution. In 1980, an ASCOPE Plan for the Control and Mitigation of Marine Pollution was initiated to enhance individual national plans. In 1986, the ASCOPE and ASEAN plans were unified into a regional oil spill contingency plan.

ASEAN Oil Spill Response Action Plan

In 1993, the then six ASEAN countries agreed to establish the ASEAN Oil Spill Response Action Plan (ASEAN-OSRAP). The objective of the Plan is to enhance the ability of a country to respond to oil spills, which exceed the response capability of the individual country. It provides a cooperative plan for mutual assistance from member states and organizations for oil spill response. The individual country's National Oil Spill Contingency Plan continues to be the guiding doctrine and its importance is in no way diminished by the formation of ASEAN-OSRAP.

The area of responsibility for the ASEAN-OSRAP includes all waters within the EEZs of the ASEAN countries and the territorial waters surrounding Singapore. The ASEAN action plan is administered by the ASEAN Focal Point Agency. The Focal Point Agency, however, does not have an operational role during an oil spill when the ASEAN-OSRAP is activated. Instead, the Lead Agency of the country whose waters are affected is responsible for initiating any action within the area of responsibility in accordance with the country's National Oil Spill Contingency Plan. If assistance from other ASEAN countries is required, the National Lead Agency of the affected country shall request assistance from the other Lead

Table 19. Programs of Action to Control Land-Based Sources of Pollution Proposed by COBSEA Project EAS-27, UNEP.

Country	Priority of Concern	Program/Activity	Time Schedule (year)
INDONESIA	Establishment of water quality objectives, standards, management and monitoring programs Waste discharges from settlements, industries and agriculture Silt from land clearance and other development activities Capacity building National/provincial jurisdiction on pollution control	**Water Quality Assessment and Monitoring** **Activity 1**: Establishment/ assessment of existing water quality (rivers, estuaries, coastal waters and ground water) and continued monitoring to observe potential trends.	1995 – 1998
		Activity 2: Establishment of water quality objectives and corresponding standards based on present and potential use of water resources.	by 1996
		Activity 3: Communication of information established under Activities 1 & 2 to be regularly transmitted to appropriate government agencies, private sectors and the general public.	1995 – 1998
		Control of Waste Discharge **Activity 1**:Development (updating) of the Master Plan for Sewerage Infrastructure.	by 1996/97
		Activity 2:Prioritization of waste management plan with emphasis on major urban centers.	by 1996/97
		Activity 3:Implementation of waste treatment systems for agricultural wastes	by 1997
		Siltation **Activity 1**: Upgrading of erosion control measures in public and private development.	by 1996
		Activity 2:Establishment of soil erosion control guidelines and verification procedures for public and private development.	by 1996/97
		Capacity Building **Activity 1.** Education and training attachments at selected institutions on waste management	1995-2000
		Activity 2. Supporting attachments for regional and provincial level officials to the related activities, including training, information and networking	1995-2000
		Public Education and Community Participation **Activity 1.** Continued public awareness campaigns, newsletters and public forums	1995-2000

continued

Table 19. Programs of Action to Control Land-Based Sources of Pollution Proposed by COBSEA Project EAS-27, UNEP.

Country	Priority of Concern	Program/Activity	Time Schedule (year)
MALAYSIA	Waste discharges from industries and agriculture Silt from land clearance and other development sites. Capacity building Federal/State jurisdiction on pollution control	**Water Quality Assessment and Monitoring** **Activity 1**: Expansion of water quality assessment and monitoring programs, and incorporation of water quality criteria and standards according to classification of rivers in accordance with beneficial uses for river basin management. **Activity 2**: Improvement of communication of information established under Activity 1. Information shall be regularly transmitted to appropriate government agencies, industry and the general public. **Activity 3**: Improvement of enforcement/implementation of EIA procedures particularly for coastal development to ensure appropriate adoption of pollution control technologies in planned development. **Control of Waste Discharge** **Activity 1**: Extension and updating of the Sewerage Master Plan to cover all urban centers in me country. **Activity 2**: Early implementation of national solid waste management plan. **Activity 3**: Development of coordinated approach to address water pollution. **Siltation** **Activity 1**: Review of soil erosion and siltation guidelines. **Activity 2**: Development of guidelines for me control of soil erosion and siltation by specific development projects.	1997-2000 On-going On-going On-going On-going by 1997 by 1995 by 1996/97

continued

Table 19. Programs of Action to Control Land-Based Sources of Pollution Proposed by COBSEA Project EAS-27, UNEP (continued).

Country	Priority of Concern	Program/Activity	Time Schedule (year)
MALAYSIA		**Capacity Building** Activity 1: Training attachments at selected institutions on waste management. Activity 2: Establishment of environment training institute to attain Department of Environment officers. **Legal Strengthening** Activity 1: Review and amendment of the Environment Quality Act, 1974 Activity 2: Review and amendment of the Environment Quality (Sewage and industrial Effluents) Regulations, 1978 with respect to discharge limits. Activity 3: Review of Environment Quality (Prescribed Activities). Activity 4: Formulation of the Marine Pollution Control regulations. Activity 5: Formulation of regulations to control tanker-cleaning activities. Activity 6: Formulation of regulations to control electroplating industry.	1996-2001 by 2000 by 1996/97
SINGAPORE	Building environmental consciousness Upgrading environmental management and infrastructure Adoption of clean technologies by industries.	**Building environmental consciousness** Activity 1: Introduction of environmental education in schools and tertiary institution. **Upgrading Environmental Management and infrastructure** Activity 1: Encouragement of waste administration recycling and in-house treatment of waste by industries. Activity 2: Upgrading of sewage treatment and sewerage systems.	On-going On-going On-going

Agencies during the mobilization phase through direct contact with the Lead Agency of the assisting country/countries. When an oil spill occurs near the boundary of two countries and spreads to the territorial waters of a neighbouring county, then each country will have an On-Scene Commander (OSC) responsible for clean-up activities in their own area of responsibility. The ASEAN-OSRAP includes a Protocol for the Equal Right of Access between Member Countries which outlines the procedures for responding to near-boundary spills.

East Asia Response (Pte.) Ltd.

In 1986, a Tiered Area Response Capability (TARC) was established by foreign oil companies, which stored their shared oil pollution equipment in Singapore. Its management was subsequently transferred to the East Asia Response (Pte.) Ltd. (EARL). EARL was established in Singapore on 18 May 1992 as a non-profit company. The founding shareholders are British Petroleum Singapore, CALTEX Services Ltd., Esso Eastern, Mobil Spill Response Inc. and Shell Response Ltd. In 1994, BHP Petroleum became a shareholder. Participation in EARL is offered to any oil-related company operating in the Asia-Pacific region and the participants are shareholders in the company, paying a retainer to EARL.

EARL has its Regional Center in Jurong, Singapore where it stores and maintains a wide range of tier three oil spill response equipment. The Center has sufficient equipment available to provide a credible response to a major tanker incident estimated to result in an oil spill of some 20,000 to 30,000 tonnes. EARL has a team of specialist staff who are able to provide technical support to companies requiring assistance and if required, it can call upon additional trained contractors. The staff of the Center are also able to provide training to delegates both in Singapore or on location and also offer consultancy services on oil spill related matters to the industry. EARL is developing plans to establish a quick response marine base in Port Dickson on the West Coast of Malaysia mid-way along the Malacca Strait.

The Petroleum Industry of Malaysia Mutual Aid Group

The Petroleum Industry of Malaysia Mutual Aid Group (PIMMAG) provides assistance in the event of a major spill in the Straits. The oil companies, led by PETRONAS (Malaysia's state-owned oil company), established PIMMAG on 1 July 1994. The main aim of PIMMAG is to provide its members with a tier two response capability for potential oil spill emergencies arising from their activities in Malaysian waters, including the EEZ. The company facilitates the sharing of industry oil spill response resources among members. PIMMAG will also support non-members response to oil spills upon request. The company augments the government's oil spill response efforts and without liability to its members, it provides the necessary oil spill response resources to the National Oil Spill Control Committee (NOSCC) to enable them to combat oil spills. The joint effort of sharing stockpiled equipment by PIMMAG greatly enhances the country's oil spill response capability.

PIMMAG is governed by a Board of Directors comprised of ordinary members with the overall responsibility for ensuring that PIMMAG objectives are met. All PIMMAG members are required to have in place an appropriate tier one response capability. The cost contribution of members is based on the total yearly barrels of persistent oil produced and/or handled through marine terminals. PIMMAG has a total oil spill response capability of 131,000 barrels (bbls) and it is planned that this capability will be increased to 199,000 bbls. These resources are at three stockpile areas, including Port Dickson.

A spiller is responsible for the management and control of the oil spill response required to combat such a spill. PIMMAG operates on a "spiller-pays" principle. The actual cost of call-out and deployment of shared PIMMAG resources in response to oil spills or training of members will be paid for by the requester. Non-members are requested to pay higher call-out costs compared to members. PIMMAG rules include comprehensive liability and indemnity clauses protecting PIMMAG and its members against any and all liabilities that may arise from the actual provision of oil spill response services.

ASEAN Committees

ASEAN also has Committees on Trade and Communication (COTAC), Science and Technology (COST), Food, Agriculture and Forestry (COFAF) and Energy and Minerals (COIME). Under COTAC, there is an expert group on marine pollution, under COST, an expert group on the environment, under COFAF, an expert group on fisheries, and under COIME, an ASEAN council on petroleum. All these bodies could include an element of the management of the Malacca and Singapore Straits in their deliberations and activities. These committees and groups are already formally established, recognised and supported politically and financially by the ASEAN member countries. They have an administrative structure, experience and a system of international communication, and their use could avoid the stress of a new organization with its delicate questions of management responsibility.

However, the littoral States view the problems of the Malacca/Singapore Straits as their responsibility, not that of ASEAN. Further, these committees and groups are not integrated and can only recommend action to their national governments. Their terms of reference and members include all of ASEAN and thus Malacca/Singapore Straits matters would have to compete with other regional matters for attention and resources. Further, following ASEAN style, there is no international technical support for these bodies, which are mostly comprised of politicians and administrators.

Lessons Learned

The effectiveness of combating a spill depends on the kind, type and amount of equipment available, the qualifications of the personnel and the availability of detailed procedures, data and information to support the process of decision-making by the On-Scene Coordinator. Most of the oil pollution equipment available along the Malacca Straits belongs

to oil companies to be used primarily in their oil ports. Oil pollution equipment, thus, consists mostly of equipment for sheltered or nearshore water, and was procured and prepared according to the assessment of the risk in each such location, not for the open waters of the Straits. EARL's equipment is quite suitable for offshore use as is that of PERTAMINA's oil port at Sambu Island near Batam Island, and that belonging to Malaysia and Singapore.

A successful oil spill response also depends on the speed and method of response. Therefore, the effectiveness of response depends on how fast the equipment arrives on the scene and the efficiency of the methods employed. Since most of the equipment belongs to the oil companies, it can be mobilized rapidly to combat oil pollution at its locale. But, if the equipment has to be used in more distant areas, then there is a need for a joint SOP between the Lead Agency and each of the owners of the oil pollution equipment. This would ensure that when the Lead Agency requests the mobilization of the equipment that it would be accomplished without delay. Caltex successfully transported a huge amount of equipment from Singapore to Dumai by sea during its oil spill response exercise in 1991. In 1992 Caltex did the same by air from Singapore to Kuala Lumpur.

The speed of response is dependent in part on the promptness of the transmission of the request for assistance to the Coordinating Center, the speed of the mobilization of equipment and the distance between the base of the equipment and the location of the incident. Apparently large ships prefer to use satellite communication in emergencies. This could cause delay in receiving emergency information, because not all of the Coastal Radio Stations have satellite communication capability. Therefore, application of the Global Maritime Distress and Safety System Convention would improve the reception of maritime emergency messages from ships.

To place proper things at the proper places, the governments and the industries in this region should undertake a risk assessment of the Straits. The operators need considerably more training since there are limited qualified personnel at the coordinator level. Better training and improved exercises should be implemented and the contingency plans should be more detailed.

ASEAN Strategic Plan of Action on the Environment (1994-98)

The ASEAN Strategic Plan of Action on the Environment 1994-1998 (Koh, 1996 as cited in Beckman, 1996) recognizes that the marine environment is under stress in ASEAN and that one of the necessary strategies is to strengthen institutional and legal capacities to implement international agreements on the environment. It also recognizes the need to enhance collaboration with international bodies overseeing the implementation of international agreements and cooperation.

One of the strategies identified in this Plan of Action is important to the ratification and effective implementation of IMO conventions on pollution of the marine environment. Strategy 4 of the said Plan aims to "strengthen institutional and legal capacities to implement international agreements on the environment. Under this strategy, two of the actions to be taken are to:

a. establish capacities to support regional efforts to implement international agreements and participate effectively in the negotiation of new or revised agreements; and

b. enhance collaboration.

ASEAN Cooperation Plan on Transboundary Pollution of 1995

The ASEAN Cooperation Plan on Transboundary Pollution of 1995 (Koh, 1996 as cited in Beckman, 1996) was signed in Kuala Lumpur in June 1995. One of the three program areas in this plan is transboundary shipborne pollution. The objectives of this program are to identify issues of common concern, to formulate appropriate strategies and to develop specific plans to control shipborne pollution. Under this plan, the States intend to strengthen existing activities in the area of marine pollution through the implementation of the Oil Spill Response Action Plan (OSRAP) and through the ratification of MARPOL 73/78. Other activities to be undertaken include promoting cooperation in enforcement activities, encouraging private sector participation in mitigating shipborne pollution, undertaking training and capacity building programs, and promoting the establishment of reception facilities.

Tripartite Technical Experts Group and the Traffic Separation Scheme

In 1971, the governments of Indonesia, Malaysia and Singapore issued a joint statement in which the three governments made clear that they had agreed on three points with respect to the safety of navigation in the Straits of Malacca and Singapore. First, that safety of navigation is the responsibility of the littoral States concerned. Second, that there is a need for tripartite cooperation. Third, that a body to coordinate cooperation, composed of members of the three States, should be established as soon as possible. Subsequently, a Tripartite Technical Expert Group (TTEG) was established by the three States to undertake a study of the safety margin for UKC and the possibility of establishing a TSS for the Straits.

In 1975, a Council on the Safety of Navigation and the Control of Marine Pollution was established at the ministerial level by the three governments. In 1976, the Council made certain proposals, including proposals for a traffic separation scheme and for a minimum UKC. In 1977, the Foreign Ministers of the three governments signed the Agreement on the Safety of Navigation in the Straits of Malacca and Singapore, which contained recommendations to improve the safety of navigation in the Straits, including a TSS.

The recommendations were submitted to the IMO by the three governments. In November 1977, the IMO Assembly adopted a resolution A375(X) on "Navigation through the Straits of Malacca and Singapore" which was based upon the recommendations of the three governments. The IMO resolution established a new routing system for the Straits, including traffic separation schemes, deep-water routes and special rules for deep-draft vessels and very large crude carriers (VLCCs). These rules and routing systems were subsequently amended in 1979 by resolution A476 (XII) on the basis of proposals by the three littoral States. The routing system came into force in 1981.

In 1994, a working group of the TTEG considered a proposal to review the existing routing system and traffic separation scheme, and its recommendations were approved by the three governments. In 1995, Malaysia, with the support of Indonesia and Singapore, submitted a proposal for new routing measures in the Malacca Strait to the Sub-Committee on Safety of Navigation of the IMO. The proposal would extend the existing traffic separation scheme much further north in the Malacca Strait. The proposed scheme cannot be implemented until further hydrographic surveys have been conducted. It is expected that revised routing measures will be submitted by the three governments when the surveys have been completed and that the IMO will then approve the new scheme.

The South China Sea Informal Working Group

The South China Sea Informal Working Group on Managing Potential Conflicts in the South China Sea has established a Technical Working Group on Safety of Shipping, Navigation and Communication which will include in its deliberations:

a. carriage of hazardous and other noxious substances in the region and mechanisms for response;

b. oil spill contingency planning;

c. coordination among South China Sea authorities of oil spill response capabilities as per provisions of OPRC, the possible establishment of a fund for management of pollution in the South China Sea.

INTERNATIONAL COOPERATION

In the development of oil spill response capability in the Straits of Malacca and Singapore and the ASEAN Region, the littoral States as well as ASEAN member countries received technical assistance from the IMO, the United Nations Environment Programme (UNEP), the United Nations Development Programme (UNDP) and donor countries, either through these UN agencies, or directly. The Maritime Incident Reporting System for the ASEAN Region (MIRSAR), its hardware and software, including training were also provided by the IMO to the lead agencies of the ASEAN-OSRAP. The Ministry of Transport of Japan

in cooperation with the IMO and the ASEAN member countries also supported an oil spill preparedness and response project to finalize the ASEAN-OSRAP. The contingency plans at the local, national, and regional levels were designed using the IMO oil pollution manuals.

The International Maritime Organization (IMO)[19]

The IMO was established by a convention adopted by the United Nations Maritime Conference of 1948. It was the first ever international body devoted exclusively to maritime matters. It took ten years for the Convention to enter into force and the Organization came into existence in 1958.

The purposes of the Organization, as summarized by Article 1 (a) of the Convention, are:

a. to provide machinery for cooperation among Governments in regulation and practices relating to technical matters affecting shipping engaged in international trade; and

b. to encourage and facilitate the general adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation and prevention and control of marine pollution from ships;

The Organization is also empowered to deal with administrative and legal matters related to these purposes.

In the ten-year period between the adoption of the Convention and its entry into force, the threat of marine pollution from ships, particularly pollution by oil carried in tankers became a major international concern. Thus, almost from the very beginning, improvement of maritime safety and the prevention of marine pollution have been IMO's most important objectives.

Structure and Activities *(Agbakoba, 1994 as cited in Chua et al., 1997)*

The Organization consists of an Assembly, a Council and four main Committees. There is also a Facilitation Committee and a number of sub-committees. To achieve its objectives, IMO has, over the last 36 years, promoted the adoption of some 39 conventions and protocols and adopted well over 700 codes and recommendations concerning maritime safety, pollution prevention and related matters.

However, many countries are constrained in their effort to effectively implement the conventions by an acute shortage of the high level manpower required or by the lack of adequate administrative or technical infrastructure. Thus, while the adoption of conventions,

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[19] *Unitl 22 May 1982, IMO was called the Inter-Governmental Maritime Consultative Organization (IMCO).*

codes and recommendations has, in the past, been IMO's most important function, in recent years, the IMO has been devoting increasing attention to enable the effective implementation of these measures throughout the world.

The purpose of IMO's technical assistance program is to help States, many of them developing nations, to ratify IMO conventions and to reach the standards contained in the conventions and other instruments. This is accomplished by the use of advisers and consultants and by organizing seminars and workshops on specific subjects either on a national, regional or global basis. IMO also operates an extensive fellowship program, which enables students from developing countries to receive training which is not available in their own country.

The IMO is also involved in numerous projects around the world, all of which are designed to improve the maritime capabilities of developing countries. They cover such subjects as shipbuilding, development of anti-pollution measures and improvement in administration. But the great majority are concerned with training, especially the development of maritime training schools and academies on both a regional and a national basis.

IMO's most ambitious project was inaugurated in July 1983 when the World Maritime University was opened at Malmö, Sweden. The University provides advanced training for students who already have some academic qualifications and working experience as administrators, teachers or managers in the shipping industry. The purpose of the University is to provide advanced training for senior personnel from developing countries who are involved in various maritime activities. Training of this type is not available in the developing countries; indeed there is no comparable institution anywhere in the world. Up to December 1993, 17 students from Malaysia, one from Singapore and 18 from Indonesia have graduated from the World Maritime University. In 1994, there were 4 students from Malaysia and 3 from Indonesia.

There is also an IMO International Maritime Law Institute in Valletta, Malta for training of specialists in maritime law. A unique feature of the Institute is that 50% of the places in each course are reserved for women. The students at the Institute not only learn about maritime law but are also taught skills necessary for the drafting of legislation, thereby helping to fill a long-felt need in international shipping. Two students each from Malaysia and Indonesia have graduated from the IMO International Law Institute.

While IMO supplies the expertise, financial support for IMO projects is provided in various ways, for example, through the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP) and individual donor nations.

The International Convention for the Safety of Life at Sea

The first IMO conference was in 1960 and focused on adopting a new version of the International Convention for the Safety of Life at Sea (SOLAS Convention). This is the most

important of all international conventions dealing with maritime safety. The present version deals with the design, construction, equipment and operation of merchant ships engaged in international voyages. SOLAS Convention is one of the oldest instruments dealing with maritime safety, the first version having been adopted at a conference held in London in 1914. Since then, there have been four other SOLAS Conventions adopted in 1928, 1948, 1960 and 1974. The latter entered into force in 1980 and has been ratified by 123 States representing virtually every coastal country in the world.

Although SOLAS requires State parties to guarantee the completeness and efficiency of inspections and surveys, many governments pay only lip service to this obligation. Therefore, IMO has sought to improve compliance by member countries with their obligations under various Conventions. Unfortunately, this task has been very difficult in practice. It is a sad fact that many governments are ineffective or lack commitment for a number of reasons.

The International Ship Management Code, which has now been incorporated into SOLAS, has been welcomed by many shipowners - including some in Australia - but unfortunately it is regarded by others as an unwarranted intrusion into management prerogative. If shipowners continue to use substandard ships and cheap, poorly trained crews, countries like the United States, the United Kingdom and possibly even Australia, will be forced to contemplate unilateral action.

The STCW Convention

Recognizing that no matter how well a ship is designed, constructed and equipped, the personnel who operate it have a crucial role in ensuring safety, IMO developed and adopted in 1978 the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW). This Convention was the first attempt to establish global minimum professional standards of personnel efficiency and knowledge for seafarers. Previously the standards of training, certification and watchkeeping of officers and ratings were established by individual governments, usually without reference to practices in other countries. This resulted in widely varied standards and procedures. This Convention prescribes the minimum standards of training and certification for all seafarers. This does not mean however that a country has to maintain only this minimum. They may impose —and in fact many countries require — higher standards and additional knowledge and skill for the certification of their seafarers.

The IMO has recently undertaken a major revision of the STCW Convention, which had become progressively obsolete due to differing interpretations of the provisions and technological developments. The result has preserved the ability of countries to adopt training arrangements that are best suited to their infrastructure and resources, provided they ensure that the level of competence required for certification is retained. It provides for a functional approach, which allows for standards of competence to be established in specified maritime skills. The review also looked at the adequacy of enforcement provisions, the lack of uniformity

between countries, shipboard procedures and the human element, including such aspects as fatigue, fitness and communications between crewmembers. But the revised Convention will still be merely a piece of paper unless the international shipping community has the will to see it work.

The International Convention on Maritime Search and Rescue

Rendering assistance to any ship or person in distress at sea has always been recognized by mariners as a normal practice and a traditional moral obligation. This obligation was given legal status when it was incorporated in international maritime law. Today, the following international treaties contain provisions requiring mariners to render assistance to vessels or persons in distress at sea: the Convention for the Unification of certain Rules of Law relating to Assistance and Salvage at Sea (Brussels, 1910), the International Convention for the Safety of Life at Sea (SOLAS) (London, 1974), the International Convention on Maritime Search and Rescue (SAR) (Hamburg, 1979) and The United Nations Convention on the Law of the Sea (Montego Bay, Jamaica, 1982).

The main purpose of the 1979 International Convention on Maritime Search and Rescue (SAR) is to facilitate cooperation between States and those participating in search and rescue operations at sea by establishing an international search and rescue plan. Parties to the Convention are required to ensure that their SAR services can give prompt response to any distress call and take urgent steps to provide the most appropriate assistance to any person in distress.

The development of national SAR plans as part of a global plan is an essential element required by the Convention. The basic aspects of the international maritime SAR plan consist of the establishment of SAR regions, or arrangements between neighboring States and the rendering of mutual assistance in SAR operations. The Convention requires each SAR region to have a Rescue Coordination Centre (RCC) which should prepare detailed plans and instructions for the conduct of SAR operations in its area of responsibility.

Ships' Routing

The introduction of provisions regarding navigation in areas covered by traffic separation schemes, or "ships' routing", was a major contribution to collision avoidance at sea. The practice of following pre-determined routes in certain ocean areas goes back to 1898 when shipping companies, regularly engaged in North Atlantic trade, established safe routes to be followed by their ships.

The main purpose of ships' routing is to improve the safety of navigation in areas of convergence, and in areas where the density of the traffic is great, or where the freedom of movement of shipping is inhibited by restricted sea-room, obstructions to navigation, limited depth or unfavourable meteorological conditions. Ships' routing has the following objectives:

a. the separation of opposing streams of traffic so as to reduce the incidence of head-on encounters;

b. the reduction of dangers of collision between crossing traffic and shipping in established traffic lanes;

c. the simplification of patterns of traffic flow in areas of convergence;

d. the organization of safe traffic flow in areas of concentrated offshore exploration or exploitation;

e. the organization of traffic flow in or around areas where navigation by all ships or by certain classes of ships is dangerous or desirable;

f. reduction of the risk of grounding by providing special guidance to vessels in areas where water depths are uncertain or critical; and

g. the guidance of traffic clear of or though fishing grounds. In addition, the increase, in recent years, in the size and draft of ships, particularly oil tankers, produced problems in certain shallow water areas and led to the establishment of deep-water routes.

Ship Reporting Systems

Incidents frequently occur in which the search and rescue organization has very little information about the ship or craft which is in distress. The immediate lack of information concerning, for example, the most probable location of the incident, the characteristics of the ship or craft, its course, speed and destination and the intentions of the captain, require the search and rescue organization to undertake the laborious process of obtaining the information to plan and implement a search and rescue operation.

Circumstances may arise in which the position of the vessel in distress is so remote from the bases of SAR units that an adequate response by them may be impossible or seriously delayed. In such cases other ships at sea are potential SAR vessels which will undertake SAR operations until the arrival of SAR units. In order to take advantage of the services provided by vessels at sea, a SAR organization needs to know the route and position of all vessels. A ship reporting system serves this purpose.

In the 1950s, to improve the organization of maritime search and rescue, some countries initiated systems to receive and compile reports on the movement of ships in areas covered by their search and rescue organizations. Today, these systems are known as “Ship Reporting Systems”. Participation is free and voluntary. They are operated on an international basis and dedicated solely to search and rescue work. Following a number of shipping disasters in the 1970s, the subject of ship reporting systems received considerable attention, and IMO

responded by preparing general principles for ship reporting systems and guidelines to make reporting systems compatible world wide.

Mandatory reporting came into effect in December 1998 (STRAITREP).

Vessel Traffic Services

The demand for increased safety in ports and their approaches, particularly in areas of environmental sensitivity, led littoral States and port authorities to introduce additional measures in the approaches to ports, in estuarine areas and in narrow channels. Such measures were variously known as vessel traffic services, vessel traffic management or port operation services, and could include monitoring or traffic surveillance, the exchange of information between a shore station and the ship, advice to the ship on how to proceed safely, or establishment of contact between port or coastal authorities and ships.

The exchange of information between a shore station and the ship is always appreciated by the ship as it is advised of such essential factors as traffic conditions and visibility and contributes to safe passage. The establishment of such navigational information services is highly recommended, particularly in areas where navigation is difficult because of the high incidence of such hazards and the density of traffic.

Liability and Compensation for Damage in Connection with Carriage of Hazardous and Noxious Substances by Sea Convention

The most recent IMO convention to be adopted is the Liability and Compensation for Damage in Connection with Carriage of Hazardous and Noxious Substances by Sea 1996 (HNS Convention 1996). The HNS Convention of 1996 is modelled on the Civil Liability and Fund Conventions, except that it covers hazardous and noxious substances rather than oil. The Convention defines its scope by reference to existing lists of hazardous substances in other instruments, such as the lists in Annex II of MARPOL 73/78 and in the International Maritime Dangerous Goods Code (IMDG) (Beckman, 1996).

IMO's Activities in the Malacca Straits Area

In 1984, IMO organized a seminar and workshop on Maritime Search and Rescue in Jakarta for the Asia-Pacific countries. The main objective of the seminar and workshop was to assist the countries in enhancing their maritime search and rescue capabilities in conformity with the provisions of the 1974 SOLAS Convention. The seminar and workshop also provided the region's government officials responsible for maritime SAR services with information relating to the development and implementation of requirements necessary for the efficient operation of the Global Maritime Distress and Safety System (GMDSS).

This seminar and workshop was followed in 1986 by a conference and study tour in Tokyo. A provisional maritime search and rescue plan was developed and adopted at the conference to form part of the global SAR plan. As a result of this effort, all the countries in the region provide maritime search and rescue services that are fully integrated in the global SAR plan.

In August 1977, the Governments of Indonesia, Malaysia and Singapore co-sponsored a submission to the IMO proposing a new routing system in the Straits of Malacca and Singapore. The proposal took into consideration the results of a four-year of hydrographic surveys of the Straits as well as the IMO General Provisions on Ships' Routing.

In November 1977, the Tenth Assembly of IMO adopted a resolution on "Navigation though the Straits of Malacca and Singapore" which described a new routing system, including traffic separation schemes, deep-water routes and special rules for deep-draft vessels and VLCCs. These rules and routing systems were subsequently amended on the basis of proposals by Indonesia, Malaysia and Singapore.

The IMO Working Group on the Malacca Straits Area (Smith and Roach, 1994)

This working group was convened by the IMO in response to growing concerns by both littoral State and maritime powers regarding the increased incidence of piracy and armed robbery against ships. These attacks are most acute in confined waters, such as international straits where the incidents not only are dangerous to the safety of the crew members under attack, but also to the environment should an accident occur as a result of the attack. The use of a "competent international organization" like the IMO is the approach favored by maritime powers in addressing problems and issues associated with navigation in international straits. They reason that since the threat is to both littroal States and maritime powers, the remedy must be international in scope. This particular working group consisted of experts from Australia, Greece, Japan, the Netherlands, Norway, the United Kingdom and the United States. The group relied heavily on officials and experts from Indonesia, Malaysia and Singapore. The IMO Council in November 1992 and the Maritime Safety Committee (MSC) in December 1992 endorsed a proposal:

> ...to visit, on a fact-finding mission, the three States bordering the Malacca/Singapore Straits, identified as an area particularly affected by pirates/armed robbers, and prepare a report on the situation in the area. The report should contain recommendations which would also be applicable in other parts of the world affected by piracy and armed robbery and should, in addition, consider the enhancement of the safety of navigation and consequentially protection of the marine environment in the Malacca/ Singapore Straits area. The United States, whose representatives participated in this study, was pleased that the broader questions of safety of navigation and the protection of the marine environment were included in the mandate of the study.

Asia-Pacific Economic Cooperation (Zarsky and Hunter, 1997)

In the past five years, Asia-Pacific Economic Cooperation (APEC) has made a notable start in promoting regional environmental cooperation. It has accepted the principle that environmental issues are a legitimate part of APEC. It has defined a framework and developed a capacity building approach that have spawned a host of initiatives and avoided political stalemate. It has sparked the interest of a widening sector of civil society.

Nonetheless, there is little yet to show for all the verbiage in terms of implementation or improvements in environmental performance. Environment officials themselves recognize the problem, defining it as the need to come up with 'deliverables'. APEC has not yet reached the critical mass to tackle two important tasks of regional environmental governance: the creation of a common vision of achievable long-term regional goals to promote ecologically sound development, and the generation of common policy frameworks for domestic environmental and resource management policy. Indeed, sustainable resource management of fisheries or coastlines has barely appeared even within the norm-and capacity building initiatives.

Environmental diplomacy at APEC must address the quiet but persistent tug-of-war between the goals of economic development, trade liberalization and ecological sustainability. An environmental summit, bringing together finance, trade, industry and environment ministers, could help to air the debate and generate creative approaches to environment and economy integration, at both national and regional levels. On the institutional side, the key to further and deeper progress is the development of effective coordinating and participatory mechanisms. An annual review of environmental work-in-progress by the Senior Officials Meeting would be a good start.

Modalities for an interface between environmental and other NGOs with APEC are sorely needed. Proposals include the creation of an environmental eminent persons group and an APEC 'council of councils' made up of representatives from national councils of sustainable development. The ability of NGOs to be critical but constructive could revitalize the environmental agenda.

The capacity of APEC to emerge over the next 5 to 10 years as an effective vehicle for regional environmental governance is not assured. Mitigating against it are four factors: (a) the high and highly competitive economic stakes in the region and the tremendous momentum toward rapid, environmentally-blind economic growth; (b) the complex, multi-polar character of politics in the region; (c) the dynamism and instability of APEC as an institution, especially the potential to dramatically expand membership; and (d) the organizational flaccidity of APEC arising from its resistance to institutionalization.

Table 20. Milestones of Environmental Cooperation at APEC.

Year	Meetings	Milestones
1989	APEC established, November, Canberra, Australia	Ministers agree to begin national scoping work on, among other issues, energy, fisheries and marine pollution
1991	Seoul declaration	Defines scope of APEC activities; firmly places regional cooperation, equity and sustainable growth on APEC agenda
1993	First leaders summit, November, Blake Island, United States	Sustainable development dialogue initiated: a. Canadian Prime Minister Chretien calls for the "greening of APEC" b. Philippine President Ramos calls for a conference on creative financing of sustainable development c. Blake Island Declaration: "Our environment is improved as we protect the quality of our air, water and green spaces and manage our energy resources and renewable resources to ensure sustainable growth"
1994	First Environment Ministerial, March, Vancouver, Canada	Produces framework for principles for integrating economy and environment in APEC and the APEC Environmental Vision Statement
	Environment/economic experts meeting, August, Hualien, Chinese Taipei	Consultation on how to implement the principles for integrating economy and environment in APEC
	Leaders and ministerial meetings, November, Bogor, Indonesia	Approved principles and vision statement a. Japan submits 3Es proposal b. Leaders task senior officials to study suggestions and reports on their progress
1995	SOM 1, February, Fukuoka, Japan	Senior officials direct working groups and committees to integrate environmental considerations into their activities and include progress on environment-related activities in regular reports to the SOM
	Leaders and ministerial meetings, November, Osaka, Japan	Implementation of sustainable development initiatives Leaders task the SOM to address cross-cutting issues
1996	Senior environmental officials meeting, March, Vancouver, Canada	Identified priority areas for environmental cooperation in APEC: sustainable cities, clean production/clean technology and protection of the marine environment
	APEC environment experts meeting, June, Quezon City, Philippines	Examined innovative financial mechanisms to support sustainable development in APEC
	Sustainable Development Ministerial, July, Manila, Philippines	Developed action program for cooperation on three priority areas (sustainable cities, clean production/clean technologies) and protection of the marine environment
1997	Environment ministers meeting, June, Vancouver, Canada	a. Approved strategies for implementation in three priority areas b. Called for coordinating mechanism for environmental work c. Discussed global environmental issues

Source: Zarsky and Hunter (1997).

However, APEC does offer promise. First, even if not perfect, APEC is in place. It provides a multilateral framework that can be utilized to promote development and environmental governance goals. Compared with no framework at all, this is a significant advantage. Second, some momentum has built up over the past five years (Table 20). Third, APEC's institutional flexibility can allow it to circumvent stalemating conflict and provide space for creative, vacuum-filling initiatives.

Finally, environmental awareness and advocacy is rising, especially in East Asia, both among elites and citizen groups. For governing elites, the local ecological and financial costs of environmental degradation are becoming increasingly apparent. Pressures are also coming from the international community to reduce global environmental damage arising from East Asia, especially climate change. APEC could be an effective arena in which to implement global environmental commitments. Most important, the role of civil society is increasing in Asia. As new voices enter the policy-making process, environmental concerns are likely to be assigned higher policy priority. The next five years are likely to be a watershed.

Basis for Cooperation Regarding Marine Reserves (White, 1985)

A draft Action Plan for the Conservation of Nature in the ASEAN has been formulated by the International Union for the Conservation of Nature (IUCN). Priorities set by this plan are: (1) establishment of a network of ASEAN reserves, (2) institution of measures to protect endangered species, (3) establishment of mechanisms for information exchange on research and management, and (4) establishment of a regional training program on conservation management.

Existing marine reserves along the Malacca/Singapore Straits include:

a. Muka Head State Park in Penang;

b. Phangna National Park near Phuket Island (established in 1981, it protects estuarine wetlands, mangrove forests and shorebird habitat);

c. Tarutao Island National Park on the west coast of Thailand (51 hilly islands that protect sea turtle nesting sites, beaches, mangrove forests, coral reef areas, all with potential for ecotourism); and

d. the Surin Islands in the Andaman Sea (proposed as a marine park with tourism potential and would protect the best coral reefs in Thailand and preserve some sea turtle nesting and mangrove areas).

Table 21. Sensitivity Ranking for Coastal Ecosystems and Habitats Regarding Spilled Oil.

Sensitivity Ranking	Habitat	Oil Spill Sensitivity Characteristics
1	Coral Reef	Delicate coral-algal symbiosis and diverse associated reef, reef flora and fauna; recovery of coral from severe oiling may take up to 5-10 years or 20-50 years for re-establishment of complete reef ecosystem; sensitive to dispersants.
2	Mangrove	Important nursery areas for commercial fish and shrimp species and supports detritus-based food chain; protects shoreline from erosion; oil may persist in mangrove habitat, especially where tidal flushing is reduced; recovery may take several years; sensitive to dispersants.
3	Estuaries	Important productive habitat for aquatic organisms; high socio-economic importance for large estuaries; difficult to adequately mitigate oil spills in estuaries.
4	Tidal Flats	Productive biological habitat; high organic matter content of sediment will increase persistence; natural cleanup recommended.
5	Seagrass Beds	Productive habitat and diverse associated flora and fauna; usually located in subtidal and not affected directly, contaminated bottom sediments may cause most damage; recovery may take several years; sensitive to dispersants.
6	Upwelling Zones	Nutrient-rich water supports concentrations of pelagic and benthic organisms; sensitive to dispersants.
7	Sandy Shores	Shore impacts vary according to substrate type.
8	Rocky Shores	Wave action and tidal flushing reduce the impacts associated with oil spills.

1 is the most sensitive, 8 the least sensitive; this is a qualitative ranking and is not based on quantitative criteria.

Source: Office of the State Minister on Environment, 1984, as cited in Chua et al. (1997).

In Indonesia, the Office of the State Minister on Population and Environment established in 1984 a modified version of a sensitivity ranking for coastal ecosystems and habitats for oil spills (Sloan, 1993) (Table 21).

Table 22 and Figure 6 show the proposed protected marine areas along the east coast of Sumatra bordering the Straits of Malacca.

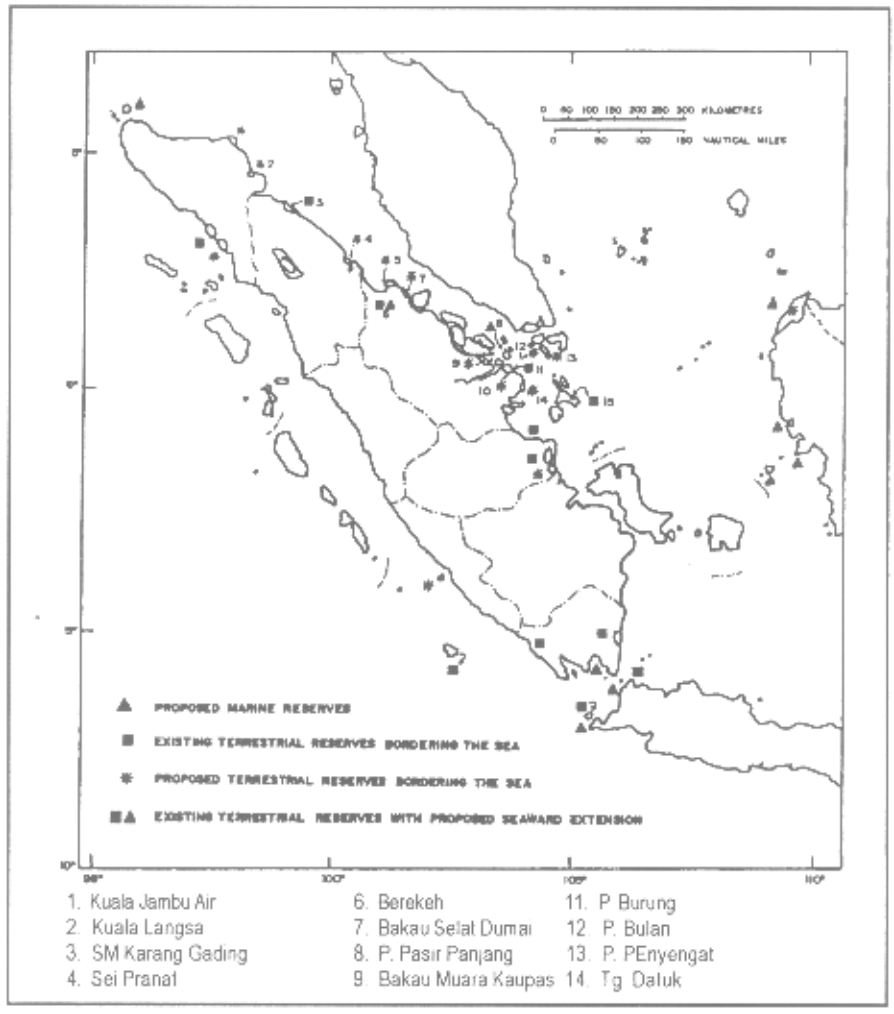
Table 22. Protected Coastal and Marine Areas along the East Coast of Sumatra.

No	Name	Status	Major Interest
Aceh			
1	Kuala Jambu Air	p,CA	Mangrove
2	Kuala Langsa	p,CA	Mangrove
North Sumatra			
3	SM. Karang Gading	Ministerial Decree of the Dept. of Forestry 11/Kpts/Um/11/80	Mangrove nesting turtles
4	Sei Prapat	p,CA	Mangrove
5	Tg. Sinebu-P. Alang Besar	p,SM	Mangrove, mangrove island
6	CA P. Berkeh	Ministerial Decree of the Dept. of Forestry 13/Kpts/Um/3/68	Mangrove nesting water birds
7	Bakau Selat Dumai	p,SM	Mangrove crocodiles
8	P. Pasir Panjang	p,TW	Mangrove islet
9	Bakau Muara Kaupas	p,CA	Fringing mangrove, swamp forest
10	Muara Gunting	p,CA	Fringing mangrove, swamp
11	CAP.Burung	Ministerial Decree of the Dept. of Forestry 13/Kpts/Um/3/68	Mangrove, nesting water birds
12	P.Bulan	p,SM	—
13	P.Penyengat	p,TW	Mangrove island
14	Tg. Datuk	p,CA	Mangrove
15	CA. P. Laut	Ministerial Decree of the Dept. of Forestry 13/Kpts/UM/3/68	Mangrove island; nesting water birds and turtles

p = Proposed
CA = Cagar Alam Laut = Strict Marine Reserve
SM = Suaka Margasarwa Laut = Managed Marine Reserve/Marine Sanctuary
TW = Taman Wisata Laut = managed Marine Reserve/Marine Sanctuary

Source: Salm and Halim 1984 as cited in Chua et al. (1997).

Figure 6. Proposed Protected Areas on the East Coast of Sumatra.



Source: Salm and Halim (1984) as cited in Chua et al. (1997).

Legislation and Agreements

The United Nations Convention on the Law of the Sea

The Malacca Straits are used for international navigation within the meaning of the United Nations Convention on the Law of the Sea (UNCLOS) (Gold, 1994). Therefore, vessels navigating through the Straits are under a regime of transit passage and the power of coastal States is very strictly limited. However, vessels in transit do have a duty to comply with international maritime safety and pollution standards. Indeed, UNCLOS Article 39(2)(b) calls for ships in transit passage to "comply with generally accepted international regulations, procedures and practices for the prevention, reduction and control of pollution from ships." Also, under UNCLOS, coastal States are given some authority to make laws and regulations related to the safety of navigation, marine pollution prevention and other matters. UNCLOS requires foreign ships to comply with such laws, but it is far less clear about how such compliance is to be enforced. Indeed, the UNCLOS enforcement procedure are complex, and in the context of transiting vessels, they are quite impractical. In general, the duty of international compliance would only permit a claim to be brought through diplomatic channels for a breach of treaty obligations, and the international conventions depend solely on the willingness of the flag State for enforcement.

Apart from the right to implement international maritime safety and marine pollution conventions, coastal States may only regulate passing or transiting vessels in respect of fishing or violations of customs, fiscal, immigration or health matters. However, enforcement must follow rules applicable to the territorial sea. In particular, the laws and regulations it adopts must not interfere with the right of innocent passage of foreign ships in the territorial sea (or transit and archipelagic passage where applicable). Furthermore, such measures must not discriminate against any ships by reason solely of their nationality. Thus, under these rules, enforcement is only permitted where the good order of the territorial sea is disturbed or where the flag State requests assistance. Furthermore, it would appear that the specific UNCLOS provision for the exercise of enforcement by coastal States is confined only to such cases. This view is reinforced by the IMO Intervention Convention which provides coastal States with considerable intervention powers when a major ship-source pollution incident outside national jurisdiction threatens the coast. If this view is correct, coastal States can only enforce their laws, even if these comply with international standards, when the offending vessel enters one of their ports.

UNCLOS Articles 41 and 42 were written to allow coastal States to establish, in conjunction with international regulations or adoption by a competent international organization, rules and regulations to promote the safe passage of ships through straits (Smith and Roach, 1994). Article 41 speaks to the creation of sealanes and traffic separation schemes. There are two traffic separation schemes in two congested and/or hazardous areas of the Straits of Malacca (near One Fathom Bank and in the northwest approach to the Singapore Strait). These schemes have been presented to and adopted by the IMO. Article 42 covers the creation of laws and regulations relating to transit passage by the Straits States. These laws and regulations may address (1) the safety of navigation and regulation of maritime traffic Article 42(1)(b), and (2) the prevention, reduction and control of pollution, only by giving effect to applicable international regulations (Article 42 (4)). The rules and regulations cannot have the practical effect of denying or hampering transit passage (Article 42(2)). Article 43 calls for user States and littoral States by agreement to cooperate:

a. in the establishment and maintenance of necessary navigational and safety aids and of other improvements in the aid of international navigation; and

b. for the prevention, reduction and control of pollution from ships.

Malaysia, Indonesia and Singapore specifically addressed their interpretation of the meaning of these articles in mid-1982. On 29 April 1982, Ambassador James Malone, the United States Representative to UNCLOS III, submitted a letter to the President of the Conference "confirming the contents" of a letter dated 28 April 1982, from the Chairman of the Malaysian delegation on behalf of the delegations of Indonesia, Malaysia and Singapore, regarding their statement concerning the purpose and meaning of Article 233 (Safeguards with Respect to Straits used for International Navigation) of UNCLOS in its application to the Straits of Malacca and Singapore.

The Malaysian statement read:

> Following consultations held among the delegations of States concerned, a common understanding regarding the purpose and meaning of Article 233 of the draft convention on the law of the sea in its application to the Straits of Malacca and Singapore has been confirmed. This understanding, which takes cognizance of the peculiar geographic and traffic conditions in the Straits, and which recognizes the need to promote safety of navigation and to protect and preserve the marine environment in the Straits, is as follows:
>
> 1. Laws and regulations enacted by States bordering the Straits under Article 41, paragraph 1(a) of the convention, refer to laws and regulations relating to traffic separation schemes, including the determination of underkeel clearance (UKC) for the Straits provided in Article 41.

2. Accordingly, a violation of the provisions of resolution A.375(X), by the Inter-Governmental Maritime Consultative Organization adopted on 14 November 1977, whereby the vessels referred to therein shall allow for an underkeel clearance of at least 3.5 meters during passage through the Straits of Malacca and Singapore, shall be deemed, in view of the particular geographic and traffic conditions of the Straits, to be a violation within the meaning of Article 233. Such measures may include preventing a vessel violating the required underkeel clearance from proceeding. Such action shall not constitute denying, hampering, impairing or suspending the right of transit passage in breach of Articles 42, paragraph 2, or 44 of the draft convention.

3. States bordering the Straits may take appropriate enforcement in accordance with Article 233, against vessels violating the laws and regulations referred to in Article 42, paragraph 1(a) and (b) causing or threatening major damage to the marine environment of the Straits.

4. States bordering the Straits shall, in taking the enforcement measures, observe the provisions on safeguards in Section 7, Part XII of the draft convention.

5. Articles 42 and 233 do not affect the rights and obligations of the States bordering the Straits regarding appropriate enforcement measures with respect to vessels in the Straits not in transit passage.

6. Nothing in the above understanding is intended to impair:

   (a) the sovereign immunity of ships and provisions of Article 236 as well as the international responsibility of the flag State in accordance with paragraph 5 of Article 42.

   (b) the duty of the flag State to take appropriate measures to ensure that its ships comply with Article 39, without prejudice to the rights of States bordering the Straits under Parts III and XII of the draft convention and the provisions of paragraphs 1, 2, 3 and 4 of this statement in unilateral acts of other States designed to restrict the rights and freedoms of the international community in the navigation and overflight and other related high seas uses.

Upon its ratification of the UNCLOS, Malaysia reiterated the statement relating to Article 233 of the Convention in its application to the Straits of Malacca and Singapore. Unfortunately, the rules for navigation in the Straits are unenforced, even though approximately one-quarter of the tankers using the Straits still fail to observe the minimum UKC, and none of the maritime authorities in the region monitors vessel compliance with the

UKC other than through the voluntary reporting to the Directorate of Sea Communications for Region II in Dumai.

Few states have explicitly addressed the transit passage regime in national laws. The United Kingdom has asserted the legal regimes applicable in some of the international straits in its waters. For example, transit passage is considered to be applicable in the Strait of Dover, the North Channel between Scotland and Northern Ireland, and the Fair Isle Gap between the Shetlands and Orkney Islands. France and the United Kingdom acknowledged the "transit passage" regime in a declaration they issued setting out the governing regime of navigation in the Dover Strait in conjunction with the signature on 2 November 1988, of an Agreement establishing a territorial sea boundary in the Strait of Dover. Also some States have claimed that the right of transit passage is available only to the signatories of the UNCLOS, or have otherwise sought to restrict the right by imposing conditions on its use not authorized by UNCLOS.

Compulsory Pilotage

Australia has introduced compulsory pilotage for some ships transiting the inner route of the Great Barrier Reef or Hydrographer's Passage. This was only achieved after intense lobbying in IMO and eventual designation of the Great Barrier Reef as a "specially sensitive area". Even so, there are countries that do not accept that Australia can lawfully impose compulsory pilotage on a transiting ship. Despite such opposition, Australia intends to seek international agreement to extend compulsory pilotage to the Torres Strait. This could create a precedent for such international waterways as the Malacca Straits, and opposition may well come from countries that usually did not support Australian initiatives in marine affairs, such as the United States, and the United Kingdom and other European maritime countries. Meanwhile, the Torres Strait will continue to be a "recommended pilotage area".

Mandatory Ship Reporting

Another Australian initiative that has been accepted internationally is the introduction of mandatory ship reporting. IMO has accepted this principle in environmentally sensitive areas. An amendment to SOLAS entered into force on 1 January 1996 allowing ship-reporting systems adopted by the IMO to be made mandatory. A joint Australia-Papua New Guinea proposal for a mandatory system for the Torres Strait and the inner route of the Great Barrier Reef was adopted by the IMO on 30 May 1996 and came into force on 1 January 1997. Mandatory reporting for the Malacca Straits came into effect in December 1998 (STRAITREP).

The United States has heretofore reacted to unilateral actions by coastal States by exercising and asserting its navigation and overflight rights and freedoms on a world wide basis in a manner that it perceives is consistent with the balance of interests reflected in

UNCLOS. The United States will not, however, acquiesce in unilateral acts of other States designed to restrict the rights and freedoms of the international community in navigation and overflight and other related high seas uses. The US Freedom of Navigation program operates on a triple track, involving not only diplomatic representations and operational assertions, but also bilateral and multilateral consultations with other governments in an effort to promote maritime stability and consistency with international law, stressing the need for and obligation of all States to adhere to the customary international rules and practices reflected in the UNCLOS.

Thus, the present main mode of enforcement is through the flag State. Under UNCLOS Article 94, the flag State has the competence and obligation to exercise "effective jurisdiction and control in administrative, technical and social matters" over ships flying its flag; to take measures necessary to ensure safety at sea with regard to the construction, equipment, sea-worthiness and manning of the ships, and the prevention, reduction and control of marine pollution (Mensah, 1994). The measures taken for these purposes must conform to generally accepted international regulations, procedures and practices.

Relevance to the Straits of Malacca and Singapore

For the coastal and port States then, having the right to adopt and enforce laws against foreign vessels in areas within their jurisdiction is one thing: the ability of coastal and port States to actually enact those laws and enforce them is another. The resources, facilities, information and personnel needed for effective exercise of jurisdiction over foreign vessels in order to protect the many vital interests of coastal and port States are so many and so varied that few states are in position to exercise fully the competence which international law bestows upon them. And yet it is important, indeed vital, for many States that they be able to effectively exercise their jurisdiction and to develop arrangements which will encourage foreign shipping to pay due attention to the interests of the coastal and port States and respect their laws and regulations. This is particularly the case with respect to the littoral States of the Straits of Malacca and Singapore where the adverse effects of unregulated ship activities can be substantial and extensive.

The situation is further complicated by the combination of factors peculiar to the area. These include:

a. the very heavy activity within a very narrow sea area and the strategic nature of the Straits;

b. the nature of the shipping services using the Straits;

c. the high vulnerability of the area in terms both of the potential of maritime casualties and their adverse effects;

d. the multiplicity of the flags and cargoes using the Straits and the absence of any major cost-effective alternative for most of the current and future users;

e. the overlapping of jurisdictions between the littoral States and the complexity of the legal situation resulting from multiple jurisdictions; and

f. the character of the Straits as those used for international navigation.

These peculiar characteristics of the Straits of Malacca make it extremely difficult for a single coastal State to formulate and enforce the laws and regulations needed to address the many issues and problems which are posed by international shipping. Such problems include:

a. the regulation of maritime traffic through the establishment of TSS for shipping and VTS for vessels in transit or approaching ports;

b. the provision of search and rescue services to ensure the availability of prompt and effective search and rescue assistance to ships in danger at sea, and thus prevent or minimize loss of life, loss of property and damage to the environment from maritime casualties;

c. the enforcement of laws and regulations to regulate the operation of vessels in the area to ensure that they conform to the applicable international standards, rules and procedures for the prevention, reduction and control of marine pollution;

d. the development and operation of arrangements to prevent unlawful acts against the safety of shipping whether in transit or destined for ports within the area; and

e. the establishment of effective contingency plans for the handling of incidents which pose serious hazards of pollution and other environmental damage.

It looks increasingly unrealistic to expect that any of the States bordering the Straits of Malacca will be in a position, by itself, to take the measures needed. There are many reasons for this. First, the responsibilities involved are onerous and the total resources needed are unlikely to be available to any one Straits State. Second, the overlap of jurisdictions between the different States is such that the measures taken by individual States will not be fully effective unless they happen to be deliberately and carefully coordinated with those undertaken by neighboring states. Thirdly, there is the danger that States may not consider it prudent to take all the stringent measures needed against foreign vessels unless they are assured that other states will do likewise, since doing so might place them at a competitive commercial or diplomatic disadvantage vis-à-vis the countries whose shipping may be affected by such measures. And finally, if there are differences, either in the content of laws and

regulations or in the ability and willingness of the respective States to implement them, there is a real possibility that the ship operators may be encouraged or tempted to disregard the laws or to take chances which could result in serious damage to individual states or to the area as a whole.

In summary, the powers of littoral States to prescribe and enforce laws governing ships exercising transit passage are very limited. They can only implement certain international rules and standards. They can take enforcement measures against vessels exercising transit passage only when there has been a violation of a law or regulation in which major damage to the marine environment of the Straits is caused or threatened. In all other circumstances, they can only contact the flag State of the offending vessel and ask it to investigate.

These considerations provide compelling justification for the adoption of a cooperative approach by the coastal and port States within the area. Such a cooperative approach not only makes it possible for the States concerned to pool their resources, but also to harmonize their policies, their laws and their procedures in ways which will facilitate the most rational use of resources, and thus reduce the financial cost to each. In addition, a collective and coordinated system of regulation is more likely both to provide the right incentive for Straits users to respect the measures taken and to elicit the cooperation and support of the international organizations and agencies whose assistance, in the form of advice and financial backing, will be needed for the success of any such joint effort.

Port State Control

The 1982 Convention is important because it recognizes that flag State enforcement is not always sufficient. Consequently, it gives port States a role in enforcing international rules and standards. Port State Control is less objectionable than coastal State enforcement because there is no need to interfere with vessels in transit and it is therefore far less dangerous. The basis for Port State control is that ports and harbours are within the internal waters of the port State where the sovereignty of the port State is not restricted (Beckman, 1996). International law permits States to impose conditions of entry on vessels entering their ports or internal waters or calling at their off-shore terminals, so long as they give appropriate publicity to such conditions of entry and the conditions are not discriminatory in nature. It is permissible for States to require that ships entering their ports meet the requirements of the major IMO conventions on navigational safety and the prevention of pollution from ships. Therefore, port States can require that all ships entering its ports meet the requirements of MARPOL 73/78 and the major IMO conventions on navigational safety, whether or not the flag State is a party to such conventions. Regional Port State Control arrangements provide an effective mechanism for ensuring that ships using international navigation routes and calling on major ports in a region comply with the rules and standards set out in the applicable IMO conventions. With respect to pollution from ships, Port State Control is

recognized in Article 211(3) of the 1982 Convention. It provides that when such conditions of entry are established in a region or subregion by a group of States in an endeavour to harmonize their policies, notice must be given to ships of this cooperative arrangement.

A possible regional or subregional approach for the Malacca Straits might be considered along the lines of the 1982 Paris Memorandum of Understanding on Port State Control. This regional arrangement, involving 14 countries bordering or near the North Sea, has as its principal objective the adoption of a general procedure for the surveillance of ships within the area. The aim of the instruments is met by the ships which operate within the jurisdiction of the participating States. These requirements relate *inter alia* to the design, construction and manning of the ships to ensure prevention of collisions and other accidents and the prevention of marine pollution, and the conditions on board the vessels regarding the employment, safety and health of the personnel of the ships. Through an "informal" treaty regime, the administration of the States concerned have developed a flexible and pragmatic arrangement which enables them collectively to take measures to enforce the relevant international rules and regulations on the vessels which come within their jurisdiction. The arrangement involves:

a. a common commitment to take all necessary enforcement action (inspection, rectification or detention, as appropriate) on a minimum agreed percentage (25%) of all ships which enter their ports;

b. an undertaking by each participating state to exchange information on measures taken by them and the results of such measures; and

c. an agreement to accept the determination and conclusions of the participating authorities regarding conditions of the vessels they inspect, i.e., a vessel which is inspected by one authority will not be reinspected by the other authorities within an agreed period.

For the effective implementation of the arrangement, the participating States have established an international secretariat and an inter-governmental committee for the harmonization of procedures and practices relating, among other things, to the inspection and detention of ships. A major feature of this arrangement is the Computer Centre, which acts as a central depository and dispenser of information on activities undertaken by the participating states and institutions of the Memorandum.

The Southeast Asian region generally, and the Malacca Straits area specifically, are ideal locations for a "port state inspection agreement" similar to its successful European counterpart. Such an agreement would not only provide the littoral States with inspection powers for vessels in their ports, but would link them with an international vessel database compiled in ports elsewhere. In this connection, a Memorandum of Understanding (MOU)

on Port State Control in the Asia-Pacific Region was agreed among 17 Asia-Pacific States in Tokyo in December 1993 and concluded in Beijing in April 1994. The signing of this MOU signals a major step toward controlling the operation of substandard ships and the problems of disposal of slop oil and sludge (Chia Lin Sien, 1994). Among the major ship-owning signatories to the agreement are China, Hong Kong, Republic of Korea, Japan and the Russian Federation. But Indonesia has not yet accepted the MOU.

MARPOL 73/78 was amended in 1995 to enhance the system of Port State Control (Beckman, 1996). Previously, the system of Port State Control in IMO conventions was limited to the port State making inspections to ensure that the ship had the necessary certificates and that the physical condition of the ship and its equipment were in order. The 1995 amendments extend Port State Control by making it possible for ships to be inspected in the ports of other parties to the Convention to ensure that crews are able to carry out essential shipboard procedures relating to marine pollution prevention. This extension of Port State Control is similar to that allowed by the 1994 amendments to SOLAS 1974. Active implementation of ship inspections as part of the requirements of Port State Control provided by the 1995 amendments to MARPOL 73/78, and as practiced by Hong Kong and Japan, should greatly improve the control of operational discharge of oil into the marine environment. The reduction in the number of substandard ships should also reduce the possibility of mishaps.

As a preliminary target, the signatory States agreed to endeavour to attain a regional annual inspection rate of 50% of the total number of ships in operation in the region by the year 2000. In implementing this Memorandum, the authorities agreed to carry out inspections of ships in order to check the certificates and documents relevant for the purposes of the Memorandum. In the absence of valid certificates or documents, or if there are clear grounds for believing that the condition of a ship or its equipment or crew does not substantially meet the requirements of a relevant instrument, a more detailed inspection will be carried out. Under this Memorandum, regional port State control includes the following instruments:

a. International Convention on Load Lines, 1966 (Load Lines 1966);

b. International Convention for the Safety of Life at Sea, as amended (SOLAS);

c. Protocol of 1978 relating to the International Convention for the Safety of Life at Sea, 1974;

d. International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978 relating thereto MARPOL 73/78;

e. International Convention on Standards for Training, Certification and Watchkeeping for Seafarers, 1978 (STCW, 1978) and ISM Code, 1996; and

f. the Convention on the International Regulation for Preventing Collisions at Sea, 1972 (COLREG 1972).

However, some of the contracting parties to the MOU still need more trained personnel, and better equipment and facilities, including reception facilities for treating waste oil. There are also insufficient vessels at the disposal of Port State Control units while aircraft surveillance and other monitoring facilities are woefully inadequate. The flag States can assist this effort by conducting proper ship surveys and ensuring that their ships fully comply with the requirements for registration. Reducing the maximum age of the ships at registration should also be considered.

Shipment of Hazardous Waste

The nuclear industries and governments of Japan, France and the United Kingdom have embarked on a multiyear, multivoyage program of shipping highly toxic radioactive materials between Japan and Europe (Van Dyke 1993, 1997; Van Dyke and Currie, 1997). The risks posed by these cargoes and the frequency of these voyages raise questions regarding the legal principles that apply to this behaviour and the appropriate responses from nations concerned about the risks to the marine environment.

Plutonium bound for Japan is either shipped as plutonium oxide, like that transported in 1992/1993 on board the Japanese-flagged *Akatsuki Maru*, or as fabricated mixed plutonium/uranium fuel. While huge volumes of low, intermediate and high level nuclear wastes are also generated in the course of reproducing Japanese nuclear fuel, Japan is presently shipping only high level nuclear waste. This waste has been classified and is moved in the form of highly radioactive glass blocks of some 1,000 pounds each. This is the type and form of waste that was first transported on the UK-flagged *Pacific Pintail* in 1995 and again on the UK-flagged *Pacific Teal* in the beginning of 1997.

High level waste contains isotopes which have half-lives ranging from 10,000 to 100,000 years and thus could contaminate marine or terrestrial life for tens of thousands of years. Japanese officials have argued that the transport ships are reinforced with a specially designed double hull and thus that the vessels would be unlikely to sink, that transport routes are selected to minimize the risk of a disaster, and that there are contingency plans to cope with accidents. Nevertheless, the shipments caused protest from dozens of States along the possible route. The shipments have raised public concern as to the threats to the marine environment and populations of coastal States, and demands from en route States for more stringent safety requirements.

One of the possible routes includes the Malacca Straits. In 1992, Singapore and Indonesia opposed the passage of the plutonium ship through the Straits because of the danger of collisions and piracy. Malaysia has developed a plan to escort the ship through the Straits if that route is taken, but has also threatened to block passage as a threat to its national security. Indeed, in 1997, Malaysia banned the *Pacific Teal* from its waters, stating that it would seek assurances from the Japanese government that the ship would not use waters under Malaysian control[20].

Upon its ratification of UNCLOS, Malaysia made a declaration, which included the following:

> 'In view of the inherent danger entailed in the passage of nuclear powered vessels or vessels carrying nuclear material or other material of a similar nature and in view of the provision of Article 22, paragraph 2, of the UNCLOS concerning the right of the coastal State to confine the passage of such vessels to sea lanes designated by the State within its territorial sea, as well as that of Article 23 of the Convention, which requires such vessels to carry documents and observe special precautionary measures as specified by international agreements, the Malaysian Government, with all of the above in mind, requires the aforesaid vessels to obtain prior authorization of passage before entering the territorial sea of Malaysia until such time as the international agreements referred to in Article 23 are concluded and Malaysia becomes a party thereto. Under all circumstances, the flag State of such vessels shall assume all responsibility for any loss or damage resulting from the passage of such vessels within the territorial sea of Malaysia.'

These shipments of high-level radioactive wastes, irradiated nuclear fuel and plutonium from Europe to Japan may be being conducted in violation of specific duties mandated by the UNCLOS, applicable treaties and customary international law, viz., the duty to protect the marine environment, the duty to notify and consult affected nations, the duty to prepare an environmental impact assessment, the duty to avoid causing harm to others, and the duty to prepare appropriate emergency contingency plans. More specific duties are being developed in regional and international documents, but a formal binding international regime to regulate these movements is not yet in place.

Nevertheless, a new regime is emerging which builds on the precautionary principle, on UNCLOS provisions and on the 1989 Basel Convention on the Control of Transboundary

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[20] *Malaysia cited the Nuclear Non-Proliferation Treaty and its own Atomic Energy Licensing Act as the basis for controlling the movement of nuclear material within its national jurisdiction, and stated that it was concerned about a possible mishap in the Malacca Strait (Reuter, 15 July, 1997). See also Eager and Stewart, 1992; AFP, 10 November, 1992: UPI Business and Financial Wire, 24 September 1992.*

Movements of Hazardous Wastes and their Disposal, the International Atomic Energy Agency, and the IMO. These latter agencies are developing instruments that confirm the requirements of prior consultation on routes and on emergencies and the preparation of environmental impact assessments. State practice, as reflected in the complaints voiced during the 1992 shipment of plutonium and the 1995 shipment of vitrified high-level wastes from France to Japan, and in the acquiescence of the vessels to these complaints, indicates that the countries involved in and affected by these shipments already understand and accept the emergence of this new regime.

Indeed, Japan apparently recognizes that the extremely hazardous nature of the cargo would preclude its movement through the territorial seas of other countries as "innocent passage". In the 1992 shipment, Japan announced that the plutonium ship would not pass through territorial seas, and also indicated that the ship would avoid the EEZs of other nations, as requested, although its statement was ambiguous on that point and the vessel apparently did pass through the EEZs of several Pacific Island countries.

It is unclear whether such a ship has the right of passage through international straits. Traffic separation schemes can certainly be imposed on the ship, and other precautions may also be appropriate. No nation would be required to allow the vessel to come into its port in case of an emergency involving the cargo, and nations could also bar the ship from their territorial seas if an accident involving the cargo raised the possibility of pollution to the marine environment. Until a new regime is fully developed, affected nations may and probably will take unilateral or regionally coordinated action to protect themselves against these shipments, including taking measures to keep the ships out of their territorial seas and EEZs.

THE BASEL CONVENTION[21]

The 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal requires states transporting hazardous wastes to notify States through which the waste is travelling, and it appears to allow the transit States to object to such transport. As of 28 February 1996, it had 100 parties including Indonesia, Malaysia, and Singapore.

The Basel Convention does not govern the movement of radioactive wastes if other international arrangements governing movements of these wastes are in place, but its approach to protecting the environment provides guidance on this topic. The Japanese government, however, has filed a declaration to the Basel Convention stating that it "understands" that the convention does not "require notice to or consent of any state for the mere passage of hazardous wastes on a vessel of a Party exercising its navigation rights under international law." The Japanese declaration appears to be in direct conflict with the Convention itself. One commentator has said that "Article 6.4 of the [Basel] Convention does not allow the exporting State to authorize a transfrontier movement of hazardous waste

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[21] *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, March 22, 1989, Art. 4(2)(f), UNEP Doc. IG.80/3 (1989), 28 I.L.M. 657 (1989).*

without the previous written consent of every transit State party to the Convention." Article 4(12) does interject some ambiguity on this matter by reaffirming the "navigational rights and freedoms as provided for in international law," but the specific requirements in Article 6(4) would probably prevail over the general language in Article 4(12). The Basel Convention also requires parties to take appropriate measures to reduce the movement of wastes "to the minimum consistent with the environmentally sound and efficient management of such wastes" and to conduct such transportation that is necessary "in a manner which will protect human health and the environment against the adverse effects which may result from such movement."

BOUNDARY RESOLUTION (Abu Bakar Jaafar and Valencia, 1985a)

In 1971, Indonesia and Malaysia concluded a treaty delimiting their territorial sea boundaries in the Straits of Malacca (Figures 7a ,7b and 7c). However the boundaries immediately to the southwest and southeast of Singapore were left unresolved. Therefore resolution of the following maritime boundaries is required:

a. Indonesia (Pulau Nipa)-Malaysia (Tanjung Piai)-Singapore (Sultan Shoal)

b. Indonesia (Tanjung Babi) - Malaysia (Tanjung Setapa) - Singapore (Tanjung Bedok)

c. Malaysia - Singapore (Pedra Branca/Pulau Batu Puteh area including ownership of the island)

The likely options for resolution of the boundaries include:

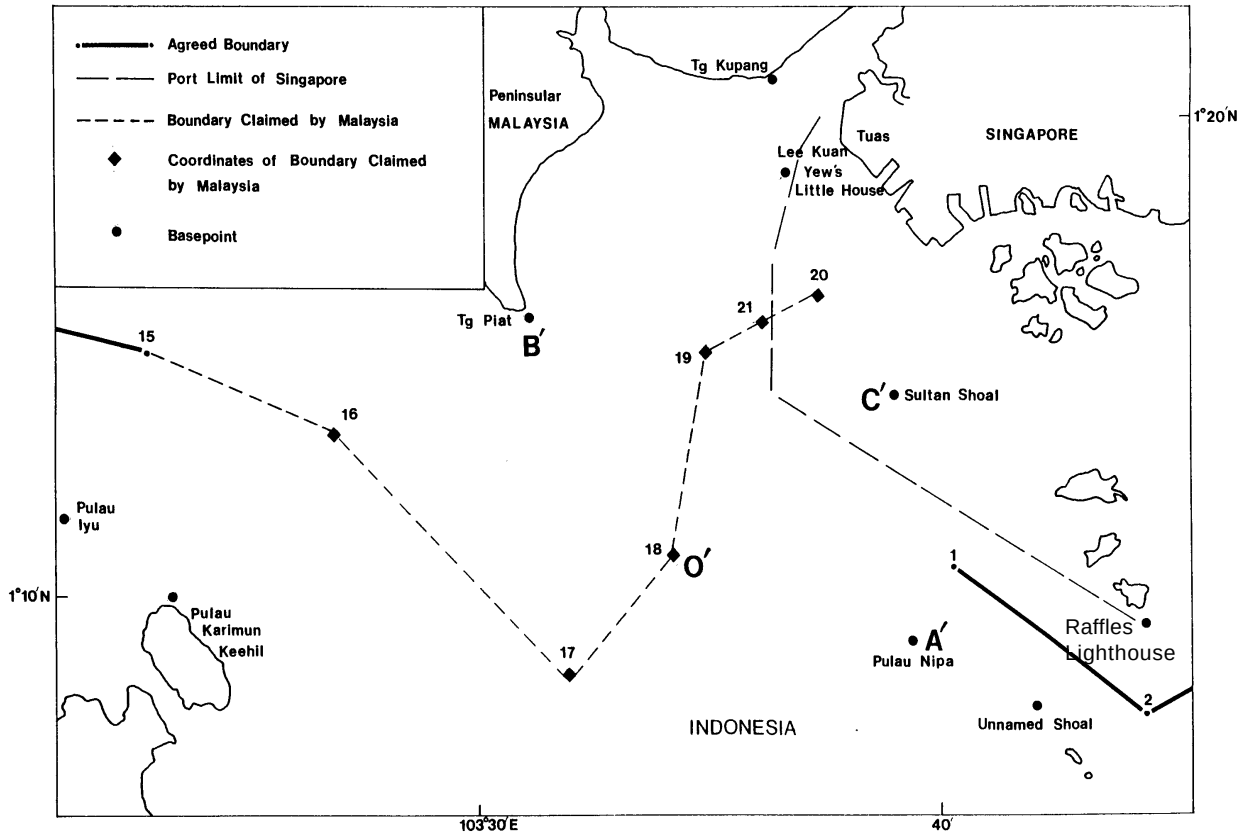
a. Delineation of the boundaries according to principles of equidistance and/or of equity;

b. Agreement to take the issue to the International Court of Justice (Malaysia and Singapore have agreed to do just that regarding ownership of Pedra Branca/Pulau Batu Puteh); or

c. Agreement on joint jurisdiction and management of the overlapping areas.

Boundary delineation is fraught with obstacles. On the basis of area gained, probably only Indonesia would favor a trilateral solution according to the principle of equidistance (Table 23). Malaysia and Singapore would probably prefer to negotiate a boundary only with each other, while Indonesia would probably prefer to negotiate a boundary with only Singapore. Malaysia and Singapore are already pursuing a bilateral settlement to the disadvantage of Indonesia, both countries have already agreed to terminate the old Johore-Singapore Treaty of 1927.

Figure 7a. Unresolved Boundaries in the Malacca Straits (Pulau Nipa Area).



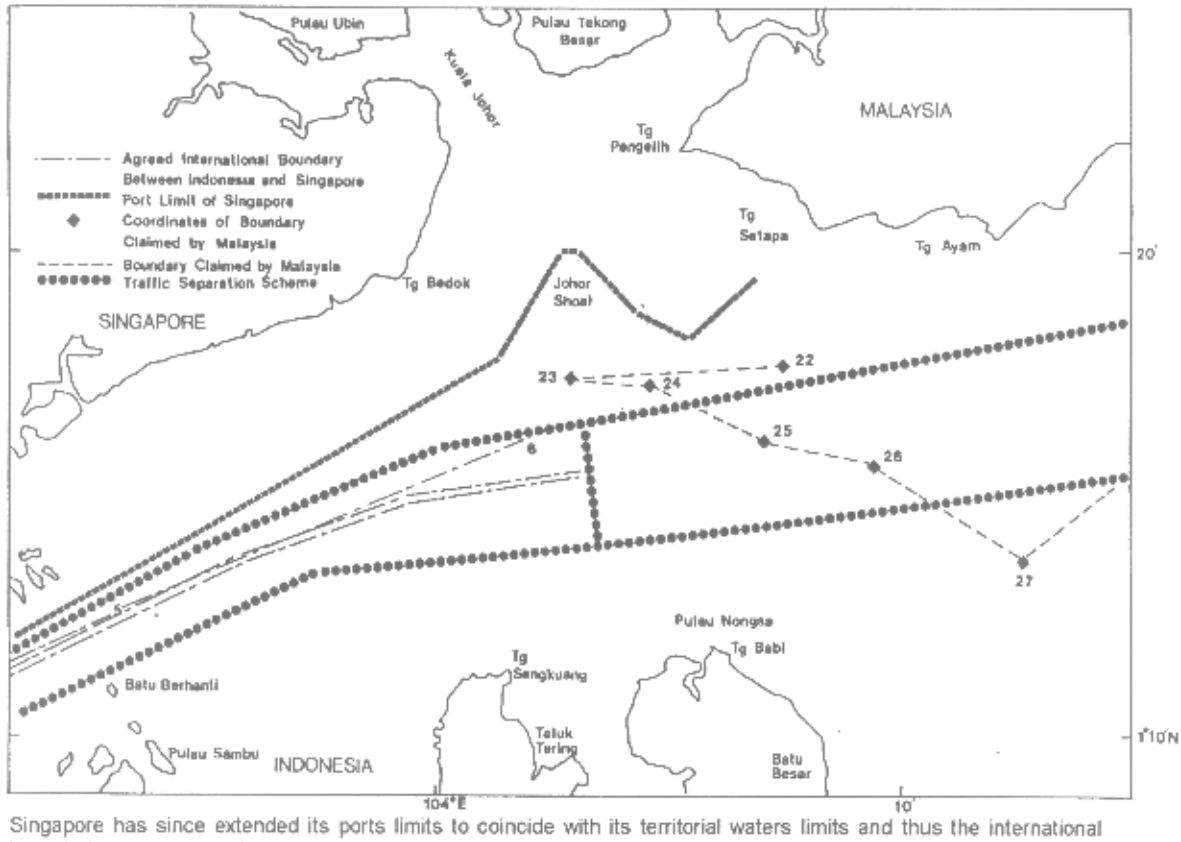
Singapore has since extended its ports limits to coincide with its territorial waters limits and thus the international boundaries were agreed.

Source: Abu Bakar Jaafar (1984).

Malaysia has several objectives in resolving its boundary with Singapore. First, it expects the incipient Johore Port at Kukup to benefit from the spillover of business from Singapore's congestion. Second, it hopes to obtain free access by sea between east and west Johore which has long been cut off by the causeway across the Strait of Johore. Third, the maritime authorities of Malaysia would then be able to enforce regulations against flag of convenience vessels that seek refuge or immunity within the unresolved areas outside the port limits of Singapore.

Singapore has now extended its port limits to the outer limits of its territorial sea. Singapore's action seems justified under the UNCLOS Article 12: "roadsteads which are normally used for the loading, unloading and anchoring of ships which would otherwise be situated wholly or partly outside the outer limit of the territorial sea, are included in the territorial sea". Joint development or joint authority may help resolve two of the three areas in dispute, but not that involving the ownership of Pedra Branca/Pulau Batu Puteh.

Figure 7b. Unresolved Boudaries in the Malacca Straits (Tanjong Babi-Tanjong Bedok Area).



Singapore has since extended its ports limits to coincide with its territorial waters limits and thus the international boundaries were agreed.

Source: Abu Bakar Jaafar (1984).

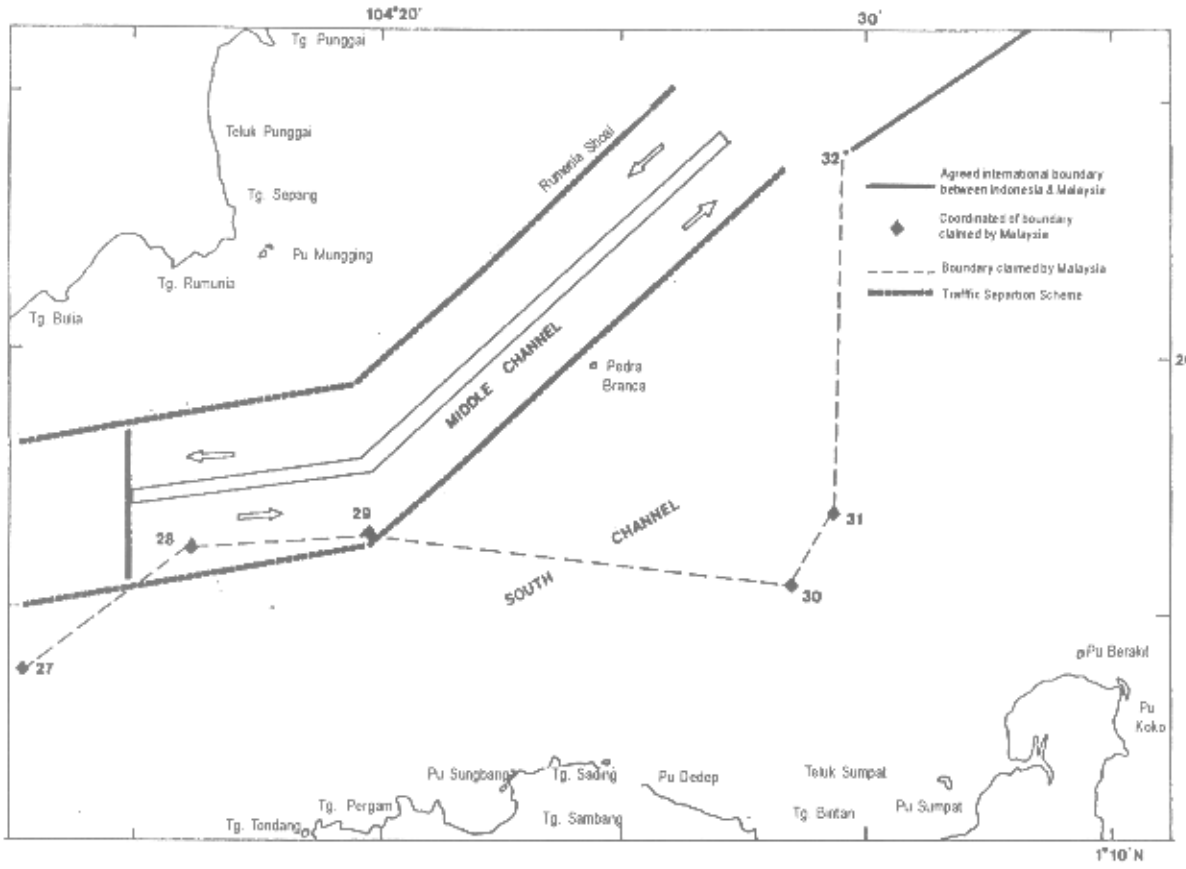
Harmonization of Legal Regimes

National vs. International Priorities and Standards

The development of specific legal regimes to implement the UNCLOS has moved from the global to the regional and bilateral level. Although there is some danger that a regional approach will lead to excessive regimes, a regional approach may be preferable to a proliferation of excessive unilateral claims. Moreover, a regional scheme may lead to the development of effective and efficient marine management more responsive to regional needs.

The UNCLOS appears to bar any action, unilateral or regional, by coastal States to impose requirements in excess of those of the vessels' flag States on vessels in passage near their shores. A number of developments, however suggest that in the future, reasonable

Figure 7c. Unresolved Boudaries in the Malacca Straits (Pedra Branca/Pulau Batu Puteh Area).



Singapore has since extended its ports limits to coincide with its territorial waters limits and thus the international boundatries were agreed.

Source: Abu Bakar Jaafar (1984).

action against vessel-source pollution may be possible for coastal States, especially when acting in regional groups. There have already been a number of unilateral assertions of jurisdiction over vessel polluters, both by coastal (Canada) and port States (the United States) (Finn, 1981). Also, many states have made unilateral claims to special purpose zones which exceed those recognized by the Convention[22]. "Creeping jurisdiction," by which regimes are made stricter and/or extended further from shore, was the trend of the 1970s; and it is not certain that this trend has been totally forestalled by the UNCLOS. Such extensions of jurisdiction for, e.g., fisheries management, may become more acceptable if they are accompanied by a genuine regionalization of resources or if they do not simply amount to a restrictive claim unaccompanied by sound management practices and efficient utilization of the resources in question (Finn, 1981). When pollution problems are involved, especially

[22] *For example., the military warning zones of DPR Korea, and the territorial seas beyond 12 nm by the Philippines and Peru.*

Table 23. A Trilateral vs. Bilateral Equidistant Boundary Settlement.

Arrangement	Area Gained (nm^2) (Percent of Total)			Total Area Being Resolved
	Indonesia	Malaysia	Singapore	Region
Trilateral	4.88 (44%)	3.45 (31%)	2.70 (25%)	11.03 (100%)
Bilateral				
Indonesia-Malaysia	+34%	+30%	—	
Malaysia-Singapore	—	+85%	+72%	
Singapore-Indonesia	+46%	—	+28%	

Source: Abu Bakar Jaafar and Valencia (1985a:Table 1).

those regional in nature or amenable to regional solutions, jurisdictional regimes stricter than those provided for the UNCLOS may become acceptable if linked to a sound regional program of environmental management.

Legal Issues Which May Arise

The following are some specific examples of legal issues which may arise:

a. Spatial interference with transit passage

To what extent do offshore mining rights prevent freedom of navigation, and do States' rights over the resources of the continental shelf prevail over other States' rights in the water column? Exploration and exploitation by Malaysia for offshore tin and by Indonesia for offshore hydrocarbons could reduce the area necessary for transit passage in the Straits. Article 78(2) of the UNCLOS says that coastal States must not cause "any unjustifiable interference with navigation and other rights and freedoms of other States..." (UNCLOS, 1982). The interpretation of "interference with navigation" may be developed cooperatively by the Straits States.

b. Innocent passage and transit passage: where do they apply?

Where is the regime of innocent passage applicable, and where is the transit passage regime applicable? For example, a Myamnar-flagged boat operated by Thai

nationals smuggling tin ore was caught by Malaysian Customs officials outside the designated lanes of the traffic separation scheme at the One Fathom Bank. The case was brought before a magistrate in the District of Klang, Selangor (New Straits Times, 1982:9). The prosecution's argument hinged on the geographical position of the boat at the time of arrest. If the boat was proceeding expeditiously in the established traffic lanes in transit passage from Thailand to Singapore, the coastal State would not have the right to impede it (UNCLOS, 1982). But if the boat was outside the lanes, the coastal State may maintain that the regime of innocent passage applies and that the smuggling of tin ore is not innocent passage. Such cases may help clarify where in the Straits the rights of coastal States end and those of flag States begin.

c. Extension of the traffic lanes and double-standards

The TSS is being extended throughout the whole length of the Straits. Initially, the coastal States were wary of establishing continuous traffic lanes as these might be construed by the maritime powers as high seas corridors in the Straits. Also, 'precautionary zones' needed to be established for cross-channel traffic.

Nevertheless, this extension might provide coastal States with an opportunity to establish, based on vessel position in the Straits, dual-pollution standards for vessel discharges. Under such a scheme, all vessels outside the traffic lanes and all occasional users would have to comply with national standards, whereas international standards would apply to those vessels in the traffic lanes or to those vessels which continuously use the Straits for through passage. A violation of national standards could constitute "a threat to the marine environment". Such passage might not be considered innocent and could be suspended (UNCLOS, 1982).

If fear of a mosaic of different standards could be removed, the validity of imposing such standards may hinge on their reasonableness. A modification of the double-standards approach would be to combine design and equipment standards with alternatives for vessels which do not or cannot conform to the regulations, such as requiring a tug escort having specified aggregate horsepower in relation to the tonnage of the tanker. This tug escort requirement might not significantly increase the costs of navigation.

d. Duties of port States

Port States have full control over all vessels within their port limits (UNCLOS, 1982). A difficulty arises when a port State refuses to admit a vessel that is not clean. The tendency is for these vessels to leave the port area and to discharge their dirty ballast in the Straits where the rights of flag States prevail over those of coastal

States, or where the enforcement capability of the coastal States is deficient. A second difficulty arises when the port State refuses to take action against a vessel which has violated international law or the laws of another coastal State, for instance, by willful pollution.

e. Traffic management (advanced vessel traffic system)

Although accidents continue to take their toll on the environment of the Straits, coastal States' efforts to promote more sophisticated systems face user objections because of cost, reliability, effectiveness and safety. Their legality may also be challenged due to perceived interference with flag State jurisdiction, imposition of charges and invalid equipment requirements. Advanced vessel traffic system (VTS) impose external supervision and control on vessel movements, ranging from surveillance and monitoring of vessel position to actual control of courses, speeds, and other vessel movements. Under VTS, navigational instructions are issued to the vessel master, but the actual navigation of the vessel remains the responsibility of the master, subject to the advice received from VTS dispatchers (UNCLOS, 1982). Arguably, VTS could be imposed on vessels in transit passage because such systems could actually enhance the passage rather than interfere with it, and also protect the environment. The cost of additional equipment and the required crew time may not be unreasonable when compared to the potential impact on safety and the environment of the Straits.

However, there are specific objections to enhanced VTS from shipowners and operators. They argue that it could require communication capacity and other equipment in excess of that commonly carried by vessels and required by general international agreements (UNCLOS, 1982). Language difficulties could muddle the communication necessary for reliable VTS. An inadequate or unreliable VTS could produce chaos in crowded traffic conditions. Enhanced VTS could also require a level of coastal State control over vessel movements and a level of disclosure of possibly sensitive information about vessel activities, cargo and characteristics which might be unacceptable to private users. Also, enhanced VTS may be perceived as a prelude to further restrictions such as statements of ownership prior to use and financial responsibility requirements.

Imposition of VTS costs on users would also present a problem. Under existing international law, charges may not be levied on foreign ships for the privilege of passage (UNCLOS, 1982). However, the UNCLOS provides that charges may be imposed on ships passing through territorial waters as payment for specific services rendered to those ships (UNCLOS, 1982). But imposition of costs for enhanced VTS services which are provided from a remote point could result in navigational

interruptions if a payment scheme did not involve contact between coastal authorities and the vessel master.

In 1995, Malaysia proposed a VTS featuring local area radar, traffic advisories and voluntary coordination of shipping in the channel (somewhat similar to air traffic control). Malaysia also presented a scheme to the IMO for redefining the shipping lanes and improving the navigational aids. This was reportedly supported by Japan, implying it may provide financial support for such improvements.

f. Tanker safety standards: special design and equipment requirements

The possibility that coastal states might attempt to impose tanker design and equipment requirements has been one of the main concerns of maritime powers (Alexander, 1997). Nevertheless, valid design and equipment issues exist. The Crude Oil Washing System (COW) has been accepted as an adequate substitute for Segregated Ballast Tanks (SBT) on existing vessels, even though COW will lead to continuing operational discharges which would have been eliminated by requiring SBT (Carter, 1978). The world oversupply of tanker tonnage makes it probable that vessels without SBT will continue to operate. In addition, the 1978 Convention on Safety of Life at Sea provides for collision avoidance radar systems (CAS) that should significantly enhance the navigational capacity of tankers in congested traffic (Finn, 1981).

The primary objection to regional implementation of such requirements has been that conflicting standards could be created by allowing different regions to impose unilateral design and equipment requirements (Finn, 1981). Even if there were conflicting standards, a vessel equipped with the best available technology would probably meet all of the standards, or at least could demonstrate that its design and equipment features would be adequate to comply with the differing regulations.

g. Imposition of charges

The coastal States may eventually wish to impose pollution costs on the users (Finn, 1981). Under a risk assessment approach, vessels could be charged fees based on the chance they will pollute and the probable extent of that pollution (Finn, 1981). Both are functions of vessel design and equipment. Thus, the risk assessment method of charges would allow vessel exemption from special design and equipment standards, and would also encourage compliance with such standards because of the costs of nonconformance (Finn, 1981). Nevertheless, imposition of a charge is of dubious legality if the charge is not related to services provided by the coastal States (Finn, 1981). However, due to the risk that vessels will cause significant pollution

in the Straits, the Straits States do provide a range of services including navigational aids, contingency capacity in case of spills and various administrative functions (Finn, 1981).

In the aftermath of the *Nagasaki Spirit* spill, public officials in Malaysia expressed a desire to charge a levy on passing ships or alternatively, to establish a system of compulsory pilotage. A meeting of littoral States officials held in Kuala Lumpur in 1992 concluded that both proposals would be difficult to implement. It was also thought that the effectiveness of these measures was doubtful, and that they could add to the problem of traffic congestion. While there was general agreement on the need to improve navigational aids, the officials also concluded that the TSS was working and effective.

h. Increased liability and compensation requirements

A significant number of oil tankers using the Malacca Straits are covered by the Civil Liability Convention (CLC), and the International Fund for Compensation of Oil Pollution Damage (FUND) as well (Finn, 1981). But injuries resulting from damage to resources that are not privately owned[23] are not recoverable.

Problems in recovering adequate compensation were illustrated by the case of the *Showa Maru*. After the *Showa Maru* accident on 8 March 1975, the Singapore Government claimed that the Taiheiyo Shipping Company, owner of the tanker owed it S$3.6 million (US$1.4 million) for the damage it had suffered. On 7 April 1975, the company paid S$1 million for direct governmental expenditures for oil removal, and in late June 1975, paid an additional S$0.52 million for the cost of oil removal by the private sector. Claims amounting to S$2.1 million for compensation of private damage, however, were never settled. The Indonesian government claimed the company owed it US$24 million and the Malaysian government claimed US$95 million. At the beginning of 1977, the company paid US$1.2 million to Indonesia, and US$0.5 million to Malaysia. Most of the unsettled claims were earmarked for damage to fisheries, but the tanker company and insurance company would not acknowledge damage or that it was as large as claimed.

There are two possible solutions: an amendment to the existing regime and the creation of a new special regional compensation fund. An amendment to the present regime could indemnify operations for liability imposed under local law which exceeded international limits. In addition, an amendment could supplement the existing Funds as necessary by "calls" for oil company contributions to cover claims which would significantly reduce the available Fund.

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[23] *For example, open seas fisheries or general physical damage.*

Although regional adoption of special rules or limits of liability may be considered, their enforcement would be difficult without direct action against vessels, including their seizure and subjection to the regional States' domestic court jurisdiction. In the absence of an international agreement under which these States agree to apply such special circumstances, courts in flag and port States would be unlikely to recognize special rules or limits of liability applying to their vessels or to vessels which are found in their ports.

Special rules or limits of liability could be applied indirectly by keying payments out of a special compensation fund to the rules and limits of liability that are adopted regionally. The chief problem in the creation of a special compensation fund would be that present international law does not recognize the competence of coastal States to impose charges for passage. Arguably, such charges would, in effect, be charges for future services such as clean-up operations or indemnification of pollution victims. The charges would be keyed to operational plans which do not exceed international standards. Creation of a special fund to receive such fees would lessen the suspicion that such charges were being used merely to raise revenue or for an invalid regulatory purpose. However, special national liability rules and limits, as well as compensation systems which differ from the international ones, would cause difficulties for vessel operators. And insurers may be unwilling to provide coverage in amounts above the general international limit. Indeed, they may hesitate to write strict liability policies or policies covering situations in which liability would not arise under the existing international regimes. Although special regional liability rules, enforcement of a higher limit of liability, and a special fund to pay clean-up costs and indemnify damages would be difficult to implement, the higher limits could provide bargaining power to encourage more rapid and satisfactory payment of claims.

i. Strait States ratification or accession to all major relevant international conventions (Table 24), and revision of their own laws and regulations accordingly.

This action could provide necessary stimulus to harmonize the laws of the three States. It would upgrade and ground the common position of the littoral States in international law should a dispute arise with the users, provide access to the relevant international machinery, and lead to improved pollution control from all sources. This action would also benefit the users in the sense that discrepancies in the interpretation of various provisions of the UNCLOS by different nations would be reduced.

On the other hand, given that the littoral States may have other priorities relating to their general economic development, there is a real question of timing, i.e., how soon such laws and regulations could be put in place and enforced in each country. Once these regionally accepted laws are established, pressure may build

Table 24. International Conventions on Marine Pollution.

Conventions	Indonesia	Malaysia	Singapore
UNCLOS 82	■	■	■
MARPOL 73/78			
Annex I/II	■	■	■
Annex III			■
Annex IV			
Annex V		■	■
London Convention			
Convention 72			
Amend 78			
Intervention			
Convention 69			
Protocol 76			
CLC			
Convention 69	■	■	
Protocol 76			■
Protocol 92	■		■
FUND			
Convention 71		■	
Protocol 76			
Protocol 92			■
COLREG72	■	■	■
SALVAGE 89			
OPRC 90		■	■
BASEL89	■	■	■

■ = ratified

Updated from Chua et al. (1997).

from environmental groups and international organizations for increased effective enforcement. Uniform standards would limit flexibility in approach commensurate with different national priorities, stages of economic development and environmental carrying capacities.

Singapore might view such a development favorably because it has a very small area of responsibility. Also, uniform standards would limit the actions of the other littoral States and make their actions more predictable, creating a stable regime

for vessel traffic of benefit to Singapore. Singapore, however, as the major flag and port State, would have more requests to take action against vessels on the basis of complaints received from its neighbors. Also, Singapore could lose the business engendered by substandard vessels which would, by the upgraded standards, be prohibited from the Straits.

Indonesia would benefit most from fees for services rendered because most laden tankers travel more in waters under Indonesian jurisdiction. Indonesia, however, would have a larger area to police. Moreover, Indonesia generally prefers to allow the private companies to assume responsibility, in accordance with best company practice. Also, Indonesia would have to upgrade its own fleet at great expense to meet the standards.

Malaysia would favor the improved pollution control in its "front yard." Substandard Indonesian fleets would be forced to upgrade, and Malaysian trade with Indonesia would improve because such vessels would no longer be prohibited from Malaysian ports. Malaysia could also impose fees for its port services. On the other hand, Malaysia would have to bear the capital costs for facilities such as slop and sludge reception and treatment at its major port, if these facilities were not centralized among the states. Malaysia would have the second largest area to control, and would be constrained from enacting rules stricter than international standards.

Japan, as the major external user for through traffic, should favor such a development. Since the rules could not exceed international standards, diversity and uncertainty would be reduced.

Designation of the Malacca Straits as "Special Area"

According to UNCLOS Article 211, coastal States may designate special areas in the EEZ for the protection of the marine environment against pollution. In such areas, coastal States may exercise three options: complete prohibition of passage, detour and through passage with complete prohibition of any discharge.

Restrictions on tanker movements and operations could be employed to prohibit tankers altogether from hazardous or sensitive areas, to restrict their navigation in such areas, or to impose more stringent requirements concerning operational discharge sensitive areas. But in the Malacca Straits, the TSS already significantly defines the appropriate traffic lanes for tankers and there is little room in the narrow portions of the Straits to restrict tanker operations any further (Finn, 1981:110).

Nevertheless, tankers navigating through hazardous or key ecological areas could be required to carry local pilots, have tug escorts or continuously report their positions. However, such restrictions on tanker movements and operations can not be imposed unilaterally.

And requiring tugs or local pilots in certain areas of the Straits probably would be opposed because of the costs and administrative and navigational inconvenience (Finn, 1981:111).

Operational discharges already are illegal in most parts of the Straits (Finn, 1981) because MARPOL 69 continues the MARPOL 54 requirement that discharges cannot be made within 50 nm from land (Finn, 1981). Additional restrictions on operational discharges could be considered for those places where discharges are still allowable. Additionally, discharge could be regulated in areas outside the Straits where such discharges would be likely to influence the environment of the Straits, including some parts of the Andaman and South China Seas.

One option is to designate the Malacca and Singapore Straits as "Special Areas" (MPP-EAS, 1999). The MARPOL 73/78 Convention in three of its Annexes, provides for the designation of specific sea areas as Special Areas:

a. Annex I (prevention of pollution by oil),

b. Annex II (control of pollution by noxious liquid substances in bulk), at present, the adoption of Annex II Special Areas by the MEPC is unlikely unless a strong case can be made based on research demonstrating the effects in a given sea area of Annex II substances discharged from ships.

c. Annex V (prevention of pollution by garbage from ships). In these Special Areas, special mandatory methods apply for the prevention of sea pollution.

The difference in discharge control regimes between Annex I Special Areas and other sea areas can be summarized as follows:

a. For oil tankers, no discharges with an oil content of more than 15 parts per million are allowed in Special Areas and also in sea areas within 50 nm from the nearest land. For other sea areas, discharges of oil are permitted at a maximum discharge rate of 30 liters per nautical mile to a maximum of 1/15,000 of the cargo for existing tankers and 1/30,000 of the cargo for new tankers;

b. For all other ships, and for discharges from oil tankers other than cargo residues, there are no differences in discharge standards between Special Areas and other sea areas.

The difference in discharge control regimes between Annex II Special Areas and other sea areas can be summarized as follows:

a. Category A substances: not more than 0.05% in weight in Special Areas instead of 0.1% in weight in other sea areas;

b. Category B substances: not more than 1 part per million in Special Areas instead of $1m^3$ and 1/3,000 of the tank capacity in other sea areas;

c. Category C substances: not more than 1 part per million and 1/3,000 of the tank capacity in Special Areas instead of 10 parts per million and 3 m^3 or 1/1,000 of the tank capacity (whichever the greater) in other seas areas; and

d. Category D substances: no differences.

The difference in discharge control regimes between Annex V Special Areas and other sea areas is that in Special Areas, garbage other than plastics and food wastes may not be discharged at all, while in other sea areas, it is permitted under certain conditions and at certain distances from the nearest land. There are no differences for the discharge of plastics and comparable substances.

A proposal to designate a given sea area as a Special Area must be submitted to the IMO for consideration by its Marine Environment Protection Committee (MEPC), at least three months before a session of the MEPC. To be designated as a Special Area, sea areas must satisfy criteria regarding oceanographic conditions, ecological characteristics and vessel traffic characteristics. A full list of criteria has been adopted and published in IMO's Guidelines for the Designation of Special Areas and Identification of Particularly Sensitive Sea Areas (IMO Resolution A.720(17), adopted November 1991).

In particular, for the designation of a Special Area, it is essential that the coastal States involved demonstrate their commitment to ensuring the availability of the necessary reception facilities by a particular date. And for the entry into force of the Special Area requirements (i.e., for a Special Area to become effective) the coastal States involved must notify the IMO that adequate reception facilities are available.

The Malacca Straits is a potential candidate for Special Area designation. The strongest case can be made with respect to Annex V. There is also a case for an Annex I Special Area but it would be extremely difficult to present an adequate proposal for an Annex II Special Area status. Special Area status for the Malacca Strait would create an added incentive for the coastal States involved to ratify the MARPOL 73/78 Convention Annex V (Indonesia, Malaysia, Singapore and Thailand). Also for a Malacca Straits Special Area status to become effective, an enforcement system, including aerial surveillance, must be developed to detect unlawful discharges by ships. Ratification of the MARPOL 73/78 Convention and/or its optional Annex V may also require changes to relevant national legislation.

Proposals to IMO should be prepared and submitted jointly by the coastal States for:

a. the designation of the Malacca Straits as an Annex I Special Area; and

b. the designation of Malacca Straits as an Annex V Special Area.

These proposals should also be discussed with the principle user States in an effort to obtain their support.

To prepare these proposals, more data are needed on

a. oceanographic conditions;

b. quantities and ecological effects of operational discharges from ships, especially garbage;

c. the availability of port reception facilities in the Malacca Straits ports for oil as well as garbage; and

d. threats to amenities as a result of discharges from ships

A strategic plan should accompany the proposals indicating how the coastal States involved will work towards the availability of reception facilities in the ports of the area and a target date for their completion. The relevant coastal States should also develop a strategic plan with respect to the enforcement of the Special Area and other MARPOL requirements in the Malacca Straits, including the use of aerial surveillance. To prevent pollution problems from being exported from the Malacca Straits to the Andaman and South China Sea areas, and because of the potential pollution problems in these two areas, the coastal States including, in this case, Thailand and India should also consider making proposals for Special Areas status for these areas.

Costs and Compensation

Transit Value of the Straits

About a fifth of all crude oil moving by sea goes through the Straits of Malacca and Singapore in a supertanker. In 1993, about a quarter of a billion tonnes of oil travelled on vessels sensitive to the draft restrictions of the Straits (Table 25) (Noer and Gregory, 1994:80).

In 1993, over half the oil transiting the Straits of Malacca and Singapore in supertankers was bound for Japan from the Arab Gulf. That oil would cost about 15.2% more to ship on the laden leg (Table 26). The total cost increase for the entire voyage would be about half, and that if the return ballast leg could still use Malacca. The rest is split between Singapore and Republic of Korea, Taiwan and Hong Kong. Singapore receives large amounts of its interregional imports by supertanker, and the longer trip south around Sumatra to the approach from the east generates a large detour. These observations underscore the divergence of Singapore's economic interests from the safety and environmental concerns of Malaysia and Indonesia. A lot of oil tankers will face a large detour if denied access to the Straits of Malacca.

Table 25. Cargoes[a] Carried by Supertankers through the Malacca Straits, 1993 (eastbound crude oil by volume and value).

Supertanker Size	Oil Volume Transported (MDWT)	Oil Value Transported (billion dollars)
160-250K DWT	102.6	13.6
Over 250K DWT	168.6	21.7
Oil via Malacca Straits in supertankers, 1993	271.2	35.2

[a] Includes only interregional shipments.

Source: Noer and Gregory (1994).

The cost of shipping laden supertankers via alternative routes includes extra fuel and operating costs en route for the detour, plus the costs of financing the capital costs of the vessel and the cargoes for a longer voyage (Table 27). It is assumed that empty supertankers could return to the Gulf by the Straits of Malacca. The total extra cost in 1993 would have been $166 million. Morisugi et al. (1992) estimate the value of the Straits for petroleum

imports for East Asia (mainly Japan, Republic of Korea and Taiwan) at about US$340 million per year compared to using the Lombok-Makassar Straits. Whichever figure is more accurate, that is a lot of money to the vessel operators when one considers that it is divided up among 286 westbound supertankers on 1,136 laden transits. For the smaller figure, that is about $146,000 per voyage on average. However, these vessels are carrying a lot of oil and when the extra voyage costs are spread over the value of the cargoes, detours add less than 1% to the price of oil landed at the destination. So, a large cost in dollar terms to the industry is a small cost to the affected economies. For economies of scale in ship size to offset the longer distance, much larger ships would be required. However, oil ports in the primary destination, Japan, typically have draft limitations much like those of Malacca Straits, so the larger vessels (including the even larger ULCCs) cannot be employed. Even for oil, there are not many deep-water facilities in East Asia.

Table 26. Oil Shipments Carried by VLCC, via the Malacca Straits.

Route	Distribution of Volume of Oil (%)		Voyage Increase Via Lombok (%)
	160,000 to 250,00 DWT	Greater than 250,000 DWT	
Gulf to Japan	24.8	30.0	15.2
Gulf to Asian NIEs	8.3	14.5	22.3
Gulf to Singapore[a]	4.8	17.0	49.7
Other	0.3	0.3	–

[a] Sunda might be a more realistic reroute. This is a "worst case" assumption for Singapore.

Source: Noer and Gregory (1994).

Service Costs

The actual services provided, as well as those contemplated in the future, can and should be quantified (Gold, 1994). However, many government departments are not capable of "costing" their services properly. Nevertheless, reasonable quantification of such costs is essential if Straits States wish to make

Table 27. The Incremental Cost of Rerouting to Lombok Supertankers Currently Using the Malacca Straits[a]

Origin and Destination	Shipping and Holding Cost Increase ($ M)	Price Increase (%)
Gulf to Japan	78.9	0.4
Gulf to Asian NIEs[b]	42.2	0.6
Gulf to Singapore	44.6	0.6
Other	0.5	0.3

[a] Assumes the return ballast leg can transit via the Malacca Straits.
[b] NIEs: Republic of Korea, Taiwan and Hong Kong.

Source: Noer and Gregory (1994)

a proper case for the services they provide. Such quantification has an additional, important benefit: it can also be utilized in a marine pollution claim, when quantification of all damage is essential for compensation purposes. On the other hand, some of these services such as navigational aids, radar and vessel traffic service stations should be easily quantifiable.

Malaysia has recently attempted to determine some of these service costs as well as the usage, frequency of accidents and other incidents in the Malacca Straits (Dato Tuan Hasim Bin Tuan Mohamed, 1994). The latter could be used to identify and rank nations that benefit from the use of the Straits.

The costs borne by Malaysia include:

a. Navigational aids

It costs the Government of Malaysia RM52 million to install 256 navigational aids in the Malacca Straits including the purchase and maintenance. The operating cost is about RM7.0 million annually, including training, replacement cost and manpower.

b. Traffic separation scheme survey in 1976

The Royal Malaysian Navy spent RM5 million to help with the survey of the TSS. The Marine Department spent RM0.5 million towards these survey activities. Most of the cost for the TSS survey was borne by Japan. Extending the present TSS survey and improving the facilities in the present TSS will cost Malaysia an estimated additional RM6.5 million. This excludes RM100 million for the proposed Traffic Services System Project (Phase I) which has been awarded to a private company. The annual operating cost for the TSS is estimated at about RM10 million.

c. Surveillance and enforcement

In 1993, the cost of maintaining a presence in the Malaysian EEZ has been estimated at RM105.3 million, less RM6.1 million for air surveillance operations. This cost excludes the cost of naval operations against sea robbers in the Straits of Malacca which has been estimated at around RM613,000 for 1993.

d. Asset building

Some 304 vessels and 21 aircraft have been assigned to the Maritime Enforcement Coordinating Centre (MECC) at Lumut. The initial cost to purchase these assets is estimated at RM6.4 billion. The operating cost to maintain these

assets would be another RM64 million a year (Hamzah, 1995)[24].

e. Routine hydrographic surveys

The Royal Malaysian Navy (RMN) has spent more than RM17 million in the last ten years (1984-1993) for survey work in the Malacca Straits-excluding the cost of surveys for the TSS in 1976. In 1993 alone, the Hydrographic Directorate of the Royal Malaysian Navy spent RM2.35 million for survey activities in the Straits. Overall the RMN spent more than RM70 million for hydrographic related activities i.e., surveys, charting, tide table production, notices to mariners and others. This cost excludes the purchase of two hydrographic vessels estimated at RM180 million and the annual operating/maintenance cost of the vessels.

f. Budget for the Marine Department

About 90% of the operational budget for the Marine Department is spent for activities related to the Malacca Straits. The budget for 1984-1993 was RM106.95 million, or about RM10.7 million a year.

g. Communications cost

It cost Telekom Malaysia RM10 million to install the infrastructure for the global maritime distress signal system (GMDSS). Although this communication facility is meant for Malaysians, vessels passing through the Malacca Straits also clearly benefit.

h. The Light Dues Board expenditure

The function of the Light Dues Board is to build and maintain light houses. Almost all the lighthouses in Malaysia are in the Malacca Straits. For 1984-1993, the operating expenditure for the Light Dues Board was RM62.08 million, averaging RM6.2 million a year. The collection for light dues for the same period was RM75 million. The surplus of RM13 million over a ten-year period is barely enough to cover the cost of building a modern lighthouse. For example, the estimated development cost of improving the lighthouse at One Fathom Bank is RM10 million.

i. Preparedness for oil spill

The Government spent RM34 million to stockpile equipment and purchased two maintenance vessels. The private sector has spent another RM30 million under

[24] *Under a separate contract concluded in 1998, Malaysia acquired 27 advanced patrol vessels at a cost of US$1.6 billion.*

the auspices of PIMMAG. This excludes the costs under OSPAR.

j Search and Rescue

This service is provided to ships plying the Malacca Straits and within its EEZ. In 1993 alone, there were 82 cases of emergency assistance. Investigating each call might cost the Malaysian Rescue Control Centre at Port KIang a minimum of RM14,000.

POLLUTION COSTS

Oil spills adversely affect fisheries, mariculture, coastal tourism, biodiversity and standing crops. Of particular concern is the impact on the intertidal zone where a number of fragile ecosystems exist. Mangroves are particularly slow to recover from major oil spills. Also, the stress caused by oil spills on the limited fringing reefs in the Straits is a serious concern.

Costs of pollution to fisheries include temporary exclusion zones, tainting, loss of market share and long-term effects on fish stocks. Following a large oil spill around Johore, lost revenues could total as much as RM98.8 million (Chua et al., 1997). Early estimates of the cost of the *Evoikos* spill were US$100 million (New Straits Times, 18 October 1997). The *Evoikos* spill threatened fish and prawn farms worth more than RM5 million.

The aquaculture industry in the Malacca Straits is rapidly expanding. The potential damage from oil spills to the aquaculture industry is particularly severe. Cockles, oysters and mussels, which are the most common types of aquaculture in the region, are also the most vulnerable to oil spills (Table 28). In the event of an oil spill around Johore, an estimated RM66.5 million could be lost by the aquaculture industry.

COSTS TO TOURISM

The fouling of beaches, coastlines and visitor facilities can profoundly affect tourism. Within the Malacca Straits, islands such as Pangkor, Penang and Langkawi, the sandy beaches of Port Dickson and Lumut in Malaysia, Batam and Bintan in Indonesia are at risk to oil spills, as is Singapore's tourist resort of Sentosa in the Singapore Strait. Oil spills within or near these areas could affect the livelihood of many thousands of people.

A good example of economic losses suffered following an oil spill was the collision between the Singapore registered oil tanker *Slimy* with the LPG carrier *Explode* in February 1993. The *Slimy* lost 5,000 tonnes of oil valued at US$7.5 million and all its bunker oil. The spill occurred about one mile south of Sentosa island. The hotel owners suffered losses of business estimated at US$1.5 million.

Table 28. Sensitivity of Cultivated Species to Oil.

Cultivation Method	Species (example)	Level of impact
Onshore tanks	Fish, crustacean, mollusks, seaweed	Moderate
Sea impoundments and ponds	Prawns, fish	Moderate/low
Intertidal Zone	Clam, razorshell, oyster, cockle, mussel	High
Seabed	Sea cucumber, abalone, arkshell	Low
Ropework suspended at sea surface by floats or poles	Sea laver, sea mustard	High
Vertical ropes/cages supported below sea by floats	Kelp, mussel, scallops, oyster, sea squirt, yellowtail, sea bream, bass, salmon	Moderate/low
Seabed enclosure	Crab, lobster	Low

Source: Chua et al. (1997).

An oil spill near a coastal resort such as Desaru in southeast Johore, could cause lost revenues from tourism amounting to some RM200-264 million. After the *Showa Maru* incident in 1975, Malaysia claimed US$10 million for the clean-up costs and damage to marine life. Indonesia and Singapore claimed US$51 million and US$1.6 million, respectively. In July 1987, the tanker *El Hani* ran aground off Raffles Lighthouse, spilling some 2,300 tonnes of crude oil and incurring S$2 million in claims. In the 1993 *Slimy* incident, the clean-up costs for Singapore authorities amounted to US$25 million. From 1978 to 1994, Malaysia expended about RM7.7 million to clean up oil spills in the Straits.

Compensation Schemes

The *Torrey Canyon* incident in 1967 provided a major stimulus to the development of four international regimes through which compensation for clean-up costs and pollution damage is available following spills of persistent oil from tankers (White, 1994). The two main regimes which were in effect until 1998, the Tanker Owners Voluntary Agreement concerning Liability for Oil Pollution (TOVALOP) and the Contract Regarding a Supplement to Tanker Liability for Oil Pollution (CRISTAL), were voluntary in nature and were established by the tanker and oil industries as interim agreements pending the widespread ratification and acceptance of two international conventions and their recent protocols developed under the auspices of the IMO. The voluntary agreement scheme terminated in 1997. The International Convention on Civil Liability for Oil Pollution Damage and its Protocols (CLC) and the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage and its Protocols (Fund Convention) are global agreements. The CLC has been ratified by 87 States and the Fund Convention by 60 States. Of the countries bordering the Malacca Straits, Indonesia has ratified the CLC (Convention

69), Malaysia has ratified both the CLC (Convention 69) and the Fund Convention (Convention 71), and Singapore has ratified the CLC (Protocols 76 and 92) and Fund Convention (Protocol 92) .

Amendments to the international conventions are difficult to bring about. Protocols to both the CLC and Fund Conventions which significantly increase the amount of compensation available were agreed in 1984, but failed to come into force. However, a Diplomatic Conference in 1992 agreed to revise the entry into force of provisions of these protocols to facilitate their implementation.

The international system of compensation created by the CLC and Fund Convention is unique in the field of environmental pollution. These regimes are based on the principle of 'strict liability'. This means that they apply regardless of whether or not the tanker owner whose vessel suffered the spill was actually at fault, subject to very few exceptions, e.g., if the spill was caused by an act of war. Thus claimants can receive compensation promptly, without the need for lengthy and costly litigation.

The primary liability to pay compensation falls to the owner of the tanker involved in an incident. Normally the owner will be entitled to limit his liability to an amount based on the tonnage of the tanker. In order to meet their potential obligations under both the voluntary agreements and international conventions, tanker owners are required to have oil pollution insurance, issued through a Protection and Indemnity Association (P&I Club).

P&I Clubs are mutual, non-profit making associations which insure their members against various third party liabilities, including oil pollution. While each Club bears the first part of any claim, the concept of mutuality is extended by the 'pooling' of large claims by the members of the international group, to which all the major P&I Clubs belong. To safeguard members in the event of a catastrophic claim, excess reinsurance is placed by the international group in the world's insurance markets. Each P&I Club has full-time managers who look after the day to day business of the Club. They are assisted by a worldwide network of commercial representatives or correspondents. It is usually the local correspondents who look after the tanker owner's and the Club's interests when an incident occurs, assisted by such technical and legal experts as are necessary.

When the compensation available from the tanker owner is insufficient to meet all valid claims, supplementary compensation may be available from the international funds established under the terms of the Fund Convention. Companies which receive heavy fuel oil or crude oil by sea contribute to this Fund. For the sake of simplicity, these oil receivers can be regarded as cargo owners. The organization which administers this Fund and pays compensation under its terms is the International Oil Pollution Compensation Fund (IOPC Fund). The IOPC Fund will take a very active interest early on in any incident in a Fund member state where it appears likely that the organization will ultimately be called upon to pay compensation.

Thus, the international regimes provide a two-tier system of compensation with the individual tanker owner whose vessel causes a spill being responsible for the first tier, and cargo owners contributing once the tanker owner's limit of liability is exceeded. The individual cargo owner involved in an incident has no direct liability for paying compensation, even though it may be their oil which needs to be cleaned up or which caused damage.

While claimants are required to submit their claims in writing to the appropriate bodies within the specified time scale, all of those potentially involved in the payment of compensation in any given incident are likely to cooperate closely in order to ensure a uniform and efficient approach. In the event of a major oil spill, a local claims office maybe established at an early stage to facilitate the submission and handling of claims on behalf of the tanker owner and P&I Club and, if it is involved, the IOPC Fund. Whether or not a local claims office is established, every effort will be made by the P&I Club and the IOPC Fund to settle valid claims promptly, either in whole or in part, in order to minimize any financial hardship suffered by claimants.

The P&I Clubs and the IOPC Fund usually appoint the same technical advisers. If the spill is serious, a member of the technical staff of the International Tanker Owners Pollution Federation (ITOPF) will normally travel to the site, primarily to give advice and assistance to whomever is in charge of the response operation, with the aim of reaching mutual agreement on the clean-up measures which are reasonable and best suited to the circumstances. This not only helps to ensure that the clean-up is as effective as possible and that the damage caused is minimized, but also that subsequent claims for compensation can be dealt with promptly and amicably. The Federation is almost always involved in the assessment of the technical merits of claims arising from cases attended onsite.

The amounts of compensation available under the CLC and the Fund Convention are as follows:

Civil Liability Convention, 1969: SDR (Special Drawing Rights) 133 (US$ 181 million) per unit of tonnage or SDR14 million US$19.6 million) whichever is less.

Fund Convention, 1971: a maximum of SDR6O million (US$82 million), irrespective of the size of the tanker. The figure is inclusive of any compensation paid by the tanker owner under the CLC.

1992 Protocols to CLC 69: SDR 3M (US$4.09 million) for ships of 5,000 grt; SDR 3M (US$4.09 million) + SDR 420 for each additional unit of tonnage for ships of 5,000-140,000 grt; SDR 59.7 million (US$81 million) for ships of over 140,000 grt.

Fund 71: SDR 135 million (US$184 million).

In the case of most tanker spills which affect the territory or territorial sea of a State

where the CLC and Fund Convention are in force, these regimes, as enacted by local law, will provide the primary remedy whereby compensation can be obtained.

Compensation in the event of an oil spill from a tanker is only certain through ratification and enactment of the relevant international conventions. However, there are limited circumstances under which the voluntary agreements would have applied where the international conventions would not, even though the affected State may have ratified one or both of the legal instruments. One such instance is the "pure threat" situation where there is deemed to be a serious threat of pollution and pre-spill preventive measures are taken, but no actual spill occurs. No compensation would be available under the terms of either convention since both require an actual spill of persistent oil to have taken place, whereas the voluntary agreements do not. These gaps in the coverage of the CLC and Fund Convention are addressed in the 1992 Protocols.

While the amounts of compensation available through the current international compensation regimes may appear to be low, historically, they have been more than adequate to compensate the victims of tanker spills, with a handful of exceptions, particularly those that occurred in the United States. However, it was recognized a decade ago that they would inevitably become less adequate with time. This was the major stimulus for the Protocols to the CLC and Fund Convention which were agreed in 1984 and revised in 1992. With the 1992 Protocols in effect, the maximum compensation available under the international conventions is increased to SDR 135 million (US$184 million). There are also provisions for a further increase to SDR 200 million (US$280 million) when sufficient States become party.

Criteria for Compensation

The international conventions provide compensation for pollution damage resulting from spills of persistent oil from tankers. While the precise definition of "pollution damage" varies somewhat between regimes, in general it extends to:

a. Preventive measures (including clean-up)

b. Property damage

c. Economic loss

d. Environmental damage (reinstatement/restoration costs only)

A number of recent major tanker spills have given rise to claims that have raised complex questions of principle and judgment, resulting in calls for the establishment of criteria for the admissibility for compensation of certain classes of claim.

The following are the views of the International Tanker Owners Pollution Federation Ltd.

Preventive Measures

The main categories of claims under preventive measures are:

a. the removal of oil (cargo and fuel) from a damaged tanker posing a serious threat; and

b. clean-up measures at sea, in coastal waters and on shore involving the use of booms, skimmers, dispersants and labor, as well as the disposal of recovered oil and associated debris.

To qualify for compensation under the international conventions, preventive measures are required to be "reasonable". While the term is not defined, it is generally interpreted to mean that the measures taken or equipment used in response to an incident were, on the basis of a technical appraisal at the time the decision was taken, likely to have been successful in minimizing pollution damage. As a general rule, the measures should be expected to enhance the natural process of oil removal. The fact that the response measures turned out to be ineffective or the decision was shown to be incorrect are not reasons in themselves for disallowing a claim for the costs involved. A claim may be rejected, however, if it was known that the measures would be ineffective but they were initiated simply because, for example, it was considered necessary "to be seen to be doing something". On this basis, measures taken for purely public relations reasons would generally not be considered "reasonable".

Most oil spill clean-up techniques have been in existence for a considerable number of years and their practical limitations, as well as the possible adverse consequences of their use, are well understood through worldwide experience during actual spill incidents. It has fluently been demonstrated, for example, that the containment and collection of floating oil on the open sea using booms and skimmers is subject to serious limitations. The mounting of a major offshore containment and collection operation can only be considered "reasonable", therefore, if conditions allow for significant amounts of oil to be recovered.

It has also been clearly established that chemical dispersants are ineffective against heavy fuel oils and most heavy crudes. Even oils which are initially dispersible soon become too viscous to disperse due to weathering processes such as evaporation and the formation of water-in-oil emulsions ("mousse"). Dispersants should also only be applied to floating oil using appropriate equipment capable of delivering the required amount of chemical. In addition, spraying operations need to be closely monitored and controlled to ensure that they remain effective.

In considering whether a specific response measure is "reasonable" in a given situation, factors other than effectiveness will also need to be taken into account. In particular, it will be necessary to consider whether the clean-up measure is likely to cause additional damage to that caused by oil alone. In the case of dispersants, consideration should be given to the potential advantages and disadvantages by analyzing the expected net benefit of their use. For example, the potential benefits to be gained from using dispersants offshore in deep water in order to protect coastlines from untreated floating oil may far outweigh the disadvantages of some limited biological damage caused by introducing oil and dispersant into the water column. On the other hand, dispersants should not be used in the vicinity of mariculture facilities and sea water intakes, or in shallow waters close to the coast, if this could increase the potential for damage through contamination.

It is recognized that the boundary between a "reasonable" and "unreasonable" measure is not always clear-cut, even after a full technical evaluation has been made. Furthermore, a particular response measure may be fully justified early on in an incident but may become inappropriate after some time has elapsed due to the weathering of the oil or other changes in circumstances. It is therefore important that all clean-up operations be closely monitored by experienced personnel to assess their effectiveness on an ongoing basis. Once it has been demonstrated that a particular method is not working satisfactorily, or it is causing disproportionate damage, it should be terminated.

The scale of any response effort should be proportionate to the size of the spill, the threat posed, the expected level of success and the ability to direct and control operations effectively. Experience has shown that the key to a successful response is effective management and control of the clean-up operation. This is particularly true for shoreline clean-up which can involve the deployment of large numbers of people and considerable amounts of equipment over wide areas.

There is an increasing tendency to manage spills by committee, allowing all interested parties access to the decision-making process whether or not they are technically qualified to participate. This is not conducive to the rapid decision-making required in spill response and leads to very large spill management teams and associated costs. It is preferable that the concerns of all interested parties in relation to response criteria are addressed during the preparation of a contingency plan.

While the technical reasonableness of clean-up measures is important, so too are the associated costs which should be based on current commercial rates or the costs of similar services. Where government or public organizations respond to oil spills, they should be compensated in such a way that they are not at a disadvantage compared with commercial contractors, although attention needs to be paid to the scale of the response effort and the appropriateness of any equipment used, including vessels and aircraft.

It is generally accepted that the capital costs of pollution equipment should be amortized over its expected in-use life to obtain a base daily rate while in use. However, once the hire period for a particular item of equipment extends beyond the point where the capital costs and overheads have been recovered, it would seem reasonable that thereafter only direct operating costs should be reimbursed.

Property Damage

An oil spill can result in physical damage to property, e.g., the contamination of fishing gear and structures used to support mariculture, fishing boats, pleasure craft and other vessels, and industrial plants through the mixing of oil into the cooling water. Compensation for damage to property as a result of a spill should, to the extent possible, be consistent with the principle that the economic position of the claimant should be no better or worse than if the spill had not occurred. When cleaning and repair of damaged property is not feasible, or the cost exceeds the replacement cost, replacement may be justified, although, where possible, allowance should be made for the age and pre-spill condition of the property in view of the potential for "betterment".

Economic Loss

Oil spills can result in economic loss to those involved in the exploitation of the marine environment. The loss may be associated with physical damage to property owned by the claimant. For example, fishers may be prevented from fishing as a result of their boats and gear being oiled. Mariculture products can be contaminated, rendering them unmarketable. However, economic loss can also be suffered by claimants even though their property has not been damaged, often referred to as "pure economic loss". Fishermen, for example, may be prevented from fishing due to oil on the surface of the sea even though their boats and gear are unaffected. Similarly, hotel owners may suffer cancelled reservations as a result of the contamination of nearby shorelines which they do not own.

The assessment of claims for economic loss can frequently be difficult and claimants will normally need to be able to prove the alleged loss; that the loss was a direct consequence of the oil contamination; that claimants were proximate to and dependent upon exploitation of the affected marine environment for their livelihood; and that mitigation of the loss was not possible.

As in the case of claims for compensation for property damage, a basic principle when assessing claims for economic loss is that the economic status of claimants should be no better or worse than if the oil had not occurred. Thus, any financial benefit e.g., clean-up wages or savings (e.g., reduced fuel or crew costs), as a direct result of the incident is normally taken into account in the determination of the net loss.

Commercial fishing and mariculture activities can be particularly at risk from oil spills, although there is no evidence from past spills worldwide of long-term damage and losses to populations of free-swimming species exploited in capture fisheries. Spilled oil can, however, contaminate fish in cages, intertidal shellfish and seaweeds, and more rarely, shallow water coastal fisheries. Even at very low concentrations which do not cause mortality, oil may create an oily taste or smell in seafood if there is direct contact, making the product unpalatable and/or unsaleable. Such tainting is, however, reversible and usually relatively short-lived. Nevertheless, the presence of floating oil or the confirmed presence of taint can make it necessary to impose fishing or harvesting bans restricting the sale of fish and shellfish. But, a ban held in place longer than justified can have serious practical and financial implications for the fishermen and needlessly escalate claims for compensation.

Properly controlled taste tests are the only sure way of judging when a ban should be imposed, and subsequently when the taint has subsided and restrictions can be relaxed. In principle, a relatively small number of samples is adequate to confirm the initial presence of taint in order to impose a restriction. Monitoring the progressive loss of taint by sampling at appropriate intervals thereafter allows the point at which taint disappears to be determined with some confidence. Once two or three successive sample sets over a short period of time remain clear, restrictions can be removed or the scope of the ban adjusted if a distinct area or species is shown to be free of taint. This approach is commonly used for serious episodes of shellfish contamination, for example by 'red tides' involving some types of plankton which can render shellfish tissue poisonous to the consumer. There is no justification for adopting a more stringent approach for a less serious contaminant like oil.

Environmental Damage

The marine environment has a value to society beyond that which it confers on those who depend upon it for their livelihood. The most straightforward examples are those who use coastal waters for aesthetic pleasure, e.g., sports fishermen, yachtsmen and scuba divers. An oil spill generally only interferes with such use of coastal waters until clean conditions are restored. It is therefore rare that any remedial measures have to be taken, other than appropriate clean-up. As a consequence, the provision of an alternative amenity or some other form of permanent remedy to such a transient problem would, in most cases, not be justified.

The controversy begins when compensation is sought for damage to natural resources which are neither commercially exploited nor used for economic return. With a major spill, there is often a presumption that some long-term effects have occurred, even though many studies have demonstrated the short-term, transient nature of most oil spill effects, primarily due to the high natural recovery capability of most marine species. In some cases, sums are sought for alleged environmental damage on the basis of abstract calculations and theoretical models. In reality, these sums are more akin to penalties rather than compensation, where

the level of the claim is all too often related to the desire to punish or to seek financial gain, rather than to directly benefit the damaged environment.

The Diplomatic Conference convened in 1984 to develop Protocols to both the CLC and Fund Convention discussed the issue of environmental damage caused by oil spills. The result was the decision to revise the definition of pollution damage in both Protocols to include "...compensation for impairment of the environment," but "...limited to costs of reasonable measures of reinstatement actually undertaken or to be undertaken." This definition was carried forward into the 1992 Protocols.

This revised definition of pollution damage in the Protocols is a codification of the position previously taken by the Assembly of the IOPC Fund that "the assessment of compensation to be paid by the IOPC Fund is not to be made on the basis of an abstract quantification of damage calculated in accordance with theoretical models." This position was re-affirmed by the recent IOPC Fund Intersessional Working Group.

The first stage of environmental restoration is clean-up. The purpose is to remove oil from the affected area so that it is returned, as near as possible, to its pre-spill condition, without causing further environmental damage. Once the clean-up phase has been completed, other positive steps to encourage natural recovery might logically follow. An example of such an approach which might be justified would be to replant a salt marsh after the bulk oil contamination had been removed. In this way, erosion of the area might he prevented and other species encouraged to return sooner than they would otherwise.

While it is frequently possible to help restore vegetation and physical structures, animals are generally a far more difficult problem. There is also a danger that effort will be concentrated on the more visible and popular inhabitants of an area in response to public and political pressures, rather than on those species which determine the overall health of a particular community. Before any program which aims to restore animal populations is implemented, there needs to be sound scientific grounds for believing that the measure will successfully enhance the natural recovery of the damaged area or a particular species known to be at risk. It would also have to be demonstrated that the restorative measures would not be detrimental to other parts of the environment. The protection of an alternative area or the provision of an alternative amenity unrelated to the damaged natural resource would not be "reasonable" if, for example, it was done merely to satisfy public or political demands.

There will always be a significant limit to the extent to which oil spill damage can be repaired. Attempts to reinstate an area to its pre-spill condition will, in most cases, be both impossible and unreasonable, especially as natural recovery is likely to be rapid in most cases.

The question of whether a particular restoration program should be considered "reasonable" is critical since there is often a temptation to carry out unrealistic programs to test academic theories. Criteria should therefore be established against which proposed restoration programs can be assessed. Examples of fundamental criteria might include:

a. restoration measures which are beneficial, given the potential for natural recovery;

b. a proposed program which is technically feasible;

c. proposed measures which are likely to be successful in significantly accelerating the natural recovery of the damaged community or the population of a species known to be at risk;

d. a program which will not in itself result in the degradation of other ecosystems/ habitats or adverse consequences for other natural resources; and

e. a proposed program whose cost is not out of proportion to the extent and duration of the damage.

The extent to which the cost of a proposed restoration program that satisfies the remaining criteria should be a factor in determining its "reasonableness" is a matter for debate. Cost certainly cannot be ignored, since there is a finite amount of compensation available under the international compensation regimes, and if the total of established claims exceeds the maximum available, all claims would have to be prorated. Therefore, the situation could arise, in which a very expensive restoration program would be to the direct detriment of other claimants who had incurred costs or suffered real economic loss and who would only receive a proportion of their valid claim in the probation exercise. The solution to the cost problem may well lie in the strict application of technical criteria, since problems are most likely to arise with speculative, unrealistic programs, or attempts to employ previously untried restoration techniques which in the end would not be an improvement over natural recovery.

How to Present a Claim for Compensation

Claims for compensation should be presented, in writing, to the tanker owner or its P&I Club under the terms of the CLC, or to the IOPC Fund under the terms of the Fund Convention, within the time period specified in the relevant regime(s). The various bodies will normally cooperate in handling and assessment of these claims. Potential claimants should contact the relevant P&I Club, or IOPC Fund early on in an incident to seek advice on the preparation and submission of claims. The IOPC Fund also publishes a Claims Manual which provides helpful guidance.

Claims should be presented clearly and in sufficient detail so that the amounts claimed can be assessed on the basis of facts. Each claimed item must be supported by relevant documentation. Photographs or videos can be helpful to explain the extent and nature of contamination and the problems caused. If adequate information or documentation in support of a claim is not provided, settlement can often be delayed. If chemical analysis or taste testing of fisheries products is undertaken in support of a claim, care must be taken to follow correct procedures with regard to the number, size, preservation and storage of samples so that the subsequent test results are not compromised and an accurate assessment of the problem can be made.

In sum, the international oil spill compensation regimes provide a straightforward mechanism whereby the costs of clean-up measures can be recovered, and compensation obtained for any damage suffered on a strict liability ('no fault') basis from the individual tanker owner and insurer involved in an incident, and from funds maintained through levies imposed on cargo owners. So long as the claims for compensation are well presented and supported by relevant documentation and evidence, few difficulties should be encountered. The total amount of available compensation should now be more than adequate to deal with the vast majority of cases. Nevertheless, there has generally been a reluctance to include compensation for so-called 'pure economic loss', which results from damages or costs associated with response and remedial measures. For example, a spill which damages a valuable commercial fishery would typically be viewed as non-compensable, since there is no damage to personal property. The compensation schemes are designed to ensure that those affected by an oil spill from a tanker are neither worse off nor better off than if the incident had not taken place. Therefore, claims of a speculative nature or claims based on theoretical calculations or economic assessments will be disputed.

Compensation Models

More recently, a less restrictive attitude towards these 'pure economic losses', is emerging, although it is still generally quite difficult to establish the cause and effect relationship. Thus, the fundamental problem to be addressed in any attempt to establish polluter liability is to determine a supportable monetary value for damages from marine pollution incidents, particularly for damages to natural resources not under private ownership. Extensive, incident-specific studies can provide insight into the magnitude of some of the environmental costs of spills. However, such studies typically involve extensive field investigation. As a result, they can be quite costly and can only be justified for extremely large environmental catastrophes. For example, at least US$6.6 million was spent on studies of the 1978 *Amoco Cadiz* supertanker crude oil spill. Clearly, such large expenditures can only be justified in the case of truly major spills. Moreover, even in the case of large spills, it is extremely difficult to measure damages because of the many inherent problems which arise in assessing the biological injuries from spills, particularly in the open ocean. However, such effects can be and have been demonstrated by natural resource damage assessment

(NRDA) models (Opaluch and Grigalunas, 1984; Economic Analysis, Inc. and Appiled Science Associates, Inc., 1987; Grigalunas et al., 1988; Grigalunas and Opaluch, 1988).

Such a model should be developed for the Malacca Straits. Given limited information, an integrated, interdisciplinary model could provide the linkages between the spill and economic damages, using the following three steps:

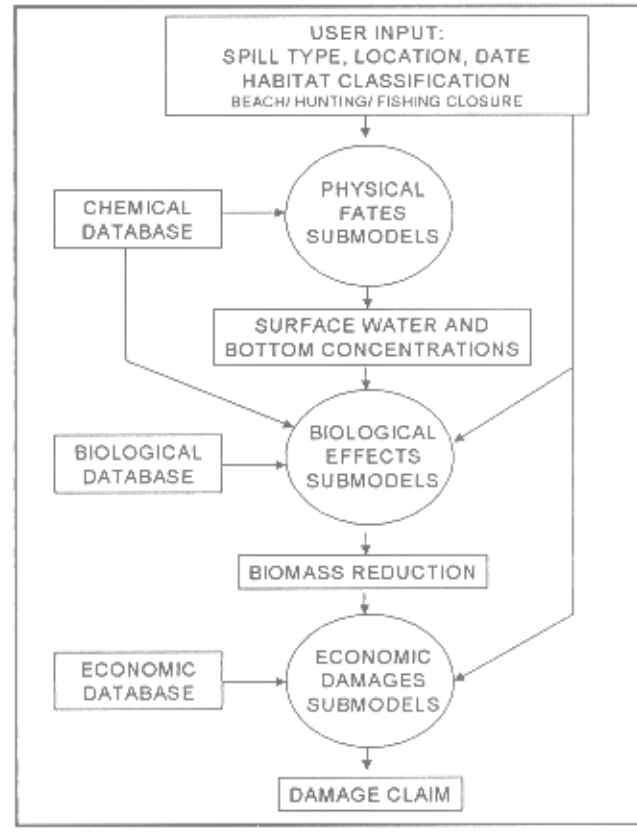
a. a physical fates submodel which stimulates the spreading and degradation of spilled substances in ocean environments;

b. a biological effects submodel which quantifies some of the resulting short- and long-term biological losses; and

c. an economic damages submodel which provides a dollar measure of injuries to biological and other publicly-controlled natural resources including public beaches.

A model was developed for use in the United States for those spills for which an extensive study, typically involving considerable field research, is not considered to be cost effective (Figure 8). This simplified approach would require minimal field observation following a spill. Because only limited information need be supplied from a user following an incident, such a model provides a relatively quick and inexpensive approach for assessing damages in those cases where a more extensive, site-specific study is judged not to be worth the cost. Also, a simplified approach can help avoid some of the adversarial problems which often arise following a pollution incident and the associated legal and administrative costs which can ensue. Additionally, the ability to demonstrate liability for damages may help to provide financial incentives to avoid pollution. This NRDA model can also be used as a planning tool to assist in decision-making or sensitivity analysis concerning potential resource use conflicts. For example, in

Figure 8. The NRDA Model for Coastal and Marine Environment.



Source: Grigalunas et al. (1992).

the United States, given estimates of hydrocarbon resources and spill probabilities from platforms, pipelines and tankers, such a model has been used as a sensitivity tool to assess the potential environmental damages from proposed offshore oil development throughout the country. The model also has been used to evaluate the potential damages from hypothetical spills associated with the possible incineration of hazardous wastes at sea.

Who Should Pay?

Many of the transit services provided have been recognized by Japan as a major transit beneficiary since 1960 (Koh, 1994). This precedent together with the cooperative efforts of the three littoral States could form the basis of a viable system of shared transit responsibilities. Further, the Malacca Straits region could provide leadership to other straits areas with this type of initiative. But if responsibilities and costs are to be shared, who exactly should do the sharing?

There are direct beneficiaries of the Straits: the three Straits States and the transit users (Gold, 1994). The latter comprise individual shipping companies as well as States such as Japan and the Republic of Korea, which rely upon this "oil lifeline" for their economic well being. There are also indirect beneficiaries. At the global level, the IMO and its membership under its principle of "safer ships and cleaner seas", benefit from a Strait provided with safe and efficient transit services. The shipping and oil industries represented by the International Chamber of Shipping, the International Union of Marine Insurers, the International Group of P&I Clubs, the Oil Companies International Marine Forum, the International Oil Pollution Claims Fund, the International Tanker Owners Pollution Federation, and many other organizations also benefit. Yet, in general, Straits users, or those who have direct or indirect interest in, or benefit from, safe and expeditious straits transit, do not appear to be making contributions comparable to the benefits gained. Such benefits must be better quantified and the commercial advantages of the services provided have to be made clearer.

There is considerable evidence that the shipping industry is often prepared to cooperate with measures which provide economic benefits[25]. For example, there are several important "straits precedents" for such cooperation. Although not totally analogous, the importance of the Turkish Straits and the responsibilities of users and the littoral state were set out in an international treaty in 1923. The treaty also created a Straits Commission composed of the littoral and major user states. This led, in 1936, to the comprehensive Montreux Convention[26].

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[25] *Shipping interests were strongly opposed to Canada's East Coast VTS when first established. However, when it was shown that the system actually expedited maritime traffic, e.g., access to pilots, shipping interests became fully cooperative.*

[26] *Convention concerning the Regime of Straits. Signed at Montreux, July 20, 1936. See also De Luca (1974).*

The Montreux Convention authorizes certain "service charges" to be imposed on transiting vessels for sanitary, lighthouse and life saving services rendered by the littoral State. Such charges are somewhat similar to the "lighthouse dues" imposed by many States on vessels in their ports. The principles of the Montreux Convention have survived UNCLOS, which specifically endorses the "legal regime in straits in which passage is regulated in whole or in part by long-standing international conventions in force specifically related to such straits" (UNCLOS, 1982) . Further, in response to several recent shipping accidents, the Turkish Government has expressed its concerns regarding the environmental consequences and has urged users of the Turkish Straits to avail themselves of the pilotage and other Straits services available[27].

A Special Regime for the Straits?

A special regime related to the Straits of Malacca and Singapore, agreed to between the coastal and user States and with the cooperation of the IMO, is not only quite feasible but probably inevitable. However, it may be best to develop such a "Malacca Straits Management Commission" step by step. The next step might be a series of technical and scientific meetings. Further steps might lead to a more formal organization which could then address the issue of shared responsibilities, including the critical cost factors involved. A good regional analogy may be the "Mekong Commission", composed of the Mekong River Delta littoral States and assisted by outside interested parties, and which is charged with the overall management and protection of the Mekong River Delta.

In view of the limitations or shortcomings inherent in the Revolving Fund and other established funds, the three Straits States might consider establishing a regional compensation fund. The advantages of such a joint fund are that a larger multinational fund might draw more matching contributions from external users, the operating principles could be designed with more sympathy for ecological damage not covered by conventional funds, and conflict could be avoided by sorting out the allocation of contributions beforehand and one time only.

JAPAN'S CONTRIBUTION TO SAFETY OF NAVIGATION IN THE MALACCA STRAITS

Malacca Straits Council

The Malacca Straits Council (MSC) as well as the Malacca Navigation Facilities Improvement Board were established in 1968 by the Japanese Ministry of Transport together with private oil and shipping companies (Chia Lin Sien, 1994). The objective of the MSC is "to promote the improvement of the navigational route in order to ensure the safety of

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[27] *Note by Turkey, Navigational and Environmental Safety in the Turkish Straits. IMO Doc. MSC 62/INF.10, March 1993.*

navigation in the Straits of Malacca and Singapore and in other necessary sea areas". The MSC has undertaken joint hydrographic surveys of the Straits of Malacca and Singapore, tidal and current studies, the improvement and maintenance of navigational aids in the Straits, production of common datum charts, clearance of navigational fairways and production of documentary films on the Straits. The financial commitment of the Council has been considerable — a total of ¥9.2 billion since the start of the organization. It is endowed with a total budget of ¥200 million while its operational budget is ¥200 million annually. In addition, the Council donated an oil skimming vessel to Singapore in 1975 and a buoy tender vessel to Malaysia. On the basis of the hydrographic charts and the current data as well as the installed navigational aids, the three Straits States successfully obtained endorsement by the IMO of the Malacca Strait Traffic Separation Scheme (TSS) which resulted in an IMO Resolution dated 14 November 1977 on "Navigation through the Straits of Malacca and Singapore".

The Japanese Government has approved a total of ¥1 billion to provide oil spill control equipment and to set up a network of information on oil control to ASEAN countries to help respond effectively to oil spill incidents. The project was sponsored by the Japanese Ministry of International Trade and Industry (MITI) and is executed by the Japan Association for Preventing Marine Accidents, a private organization. In response to the *Evoikos* spill, Japan sent six specialists and two oil skimmers.

Oil Spill Response Action Plan

A Memorandum of Agreement on an Oil Spill Response Action Plan (OSRAP) between Japan and the Governments of the ASEAN was signed on 20 May 1993, (Malaysia signed just recently). The purpose of the Project is to foster cooperation between Japan and ASEAN to combat oil spills in the ASEAN maritime area. The Project was sponsored by Japan's Ministry of International Trade and Industry (MITI) and is executed by the Japan Association for Preventing Marine Accidents. Financial support for the project began in 1993 and emanates from the Sasakawa Foundation and the Japanese Shipowners Association. The first of the support bases for oil spill response equipment was set up in Singapore in March 1993 to handle any oil spill that may occur in the Straits of Malacca. The Project also developed an ASEAN Oil Spill Information Network.

Petroleum Association of Japan

The Petroleum Association of Japan (PAJ) is a non-profit trade association, established to encourage sound development of the Japanese petroleum industry. In January 1973, PAJ established the PAJ Oil Spill Cooperative which is annexed to PAJ as a voluntary mutual aid organization. To further strengthen its capability, MITI arranged a government subsidy for the Major Oil Spill Response Programme which began implementation in 1991 through PAJ. Some ¥250 million worth of equipment has been supplied by PAJ to act as a support

stockpile for Southeast Asian countries in the event of a major oil spill. The target is to provide a capacity to handle a 10,000-tonne oil spill in the Straits and to act as a support base for "secondary mobilization" to support an initial response in the event of a major spill. PAJ will lend the equipment free of charge to countries in the region in the event of a major oil spill. There are three stockpiles for the Straits, one each in Singapore, Port Dickson and Port Klang. PAJ also organizes training courses in the use of the equipment and on oil spill response, as well as research on diffusion-drift modelling of spilled oil, changes of properties of oil through weathering processes, and the self-clean-up mechanism of the ocean regarding spilled oil.

Revolving Fund

The Revolving Fund for Combating Oil Spills from Ships in the Straits of Malacca and Singapore was established in 1981 as a supplement to the existing international arrangement for compensation in the event of an oil spill. It was mandated by a Memorandum of Understanding signed by Indonesia, Malaysia and Singapore, and the Malacca Straits Council, the latter representing Japanese non-governmental interests. Under the MOU, ¥400 million was donated by Japan to the Fund.

The Revolving Fund allows any of the three littoral States to take an advance for use in combating an oil spill from a ship (Teh Kong Leong, 1994). When compensation is received from those responsible, the amount is to be paid back, hence the term "revolving". The Revolving Fund is controlled by a Revolving Fund Committee comprised of one representative from each littoral State. The Committee meets at least once a year, to deliberate on various matters, including approving the annual budget. The littoral States take turns managing the Fund, each for five years.

Following the collision between the *Nagasaki Spirit* and the *Ocean Blessing*, Malaysia and Indonesia applied for advances from the Fund. Although Malaysia estimated its total clean-up costs at $3.7 million, its application on 6 October 1992 was for US$580,000, while Indonesia's application on 20 October 1992 was for US$660,000. Both applications were approved by the Revolving Fund Committee, and paid out on 19 October 1992 and 10 November 1992, respectively. Both sums have not been repaid. The principal sum remaining in the Revolving Fund is approximately US$0.4 million.

Standard Operating Procedure for Joint Oil Spill Combat in the Straits of Malacca and Singapore

In 1984, the Revolving Fund Committee adopted the Standard Operating Procedure for Joint Oil Spill Combat in the Straits of Malacca and Singapore (SOP). The objective of the SOP is to enable the littoral States to take prompt measures, either individually or together, to combat oil spills from ships. The Fund covers the direct cost of operations combating the

spill. The bank interest of the Fund is also used for joint exercises by the littoral States, thus enhancing personnel skills and coordination of the joint effort.

To test the SOP, three joint oil spill combat exercises have been conducted:

a. The first exercise, hosted by Indonesia, was carried out for two days in 1986 off Pulau Sambu in the Singapore Strait. It was organized by Indonesia's Department of Communication. The exercise was attended by representatives from the Governments of Indonesia, Malaysia and Singapore as well as the oil industry such as PERTAMINA. A total of 10 vessels and approximately 200 persons were involved.

b. In 1990, Malaysia hosted the second exercise which was held for three days off Pulau Kukup at the southern end of the Malacca Strait. The exercise was jointly organized by the Department of Environment and the Maritime Department of Malaysia. Apart from the participation of 18 vessels and approximately 120 persons, the exercise also involved an aircraft spraying simulated dispersants. The exercise was attended by representatives from the Governments of Indonesia, Malaysia and Singapore, and the major oil companies (Esso, Shell, Caltex, Mobil, PETRONAS) based in Malaysia and Singapore. The Regional Programme Officer for Asia and the Pacific of the IMO also participated in the exercise as a resource person.

c. Singapore hosted the third exercise in September 1993, at the southern fringe of the Singapore Port limits. The three-day exercise was jointly organized by the Port of Singapore Authority and the Marine Department. Besides official delegates from the three coastal States, a technical adviser from the Malacca Straits Council also attended the exercise. Other participating agencies were the Tiered Area Response Capability (TARC) Committee which represented the local oil industry (BP, Caltex, Esso, Mobil, Shell), TARC's operating agent, the EARL and the PAJ. Of particular significance was the participation of resource persons from EARL and the PAJ. In all, 14 vessels and approximately 140 persons took part in the exercise.

With the SOP and the exercises carried out so far, the three countries are better prepared financially, and in terms of equipment, personnel and rapport to handle most oil spills. The building of rapport is a continuous process because officials change or move on. More joint exercises are anticipated, with more resources expected to be committed by the littoral States and by industry.

Nevertheless, more resources are needed to enable the States to be prepared to combat larger spills. Also, with inflation, the amount available in the Fund diminishes with time. It is now thirteen years since it was set up and it would be timely for fresh funds to be made available, either from the original donors or from new contributors. The interest drawn on the Revolving Fund could be used to finance the monitoring, surveillance and enforcement

(MSE) of the TSS. The methods and procedures could be coordinated among the littoral states. The actual MSE, however, could be implemented on a national basis. If funds are not sufficient for MSE implementation, allocation of costs could become an issue. Alternatively the Straits States might wish to seek contributions from User-States, including extra-regional flag States. Such allocation might be made on the basis of relative risk.

A STRAITS STATE FUND?

To get the process started and to demonstrate sincerity and concern, the Straits States might themselves initially establish a Fund for management of the Straits with the expectation that other user States will eventually contribute. If the coastal States themselves must raise the initial funds, possible bases for allocation for costs and responsibilities include risk, geography, economic position and benefits derived from the Straits (Finn, 1981; Abu Bakar Jaafar and Valencia, 1985a). Whereas, allocation of costs for the contingency plan might place more emphasis on risk, country contribution to the compensation fund, geography, and the value of resources at risk. Any criteria acceptable to the three littoral States will likely be a hybrid.

a. Risk

Risk allocation could include, first, a breakdown between risk of spills from off exploration/exploitation and that from tankers. Risk from tankers could further be assigned among external flag, transiting tankers and local flag or traffic. Further consideration could be given to factors influencing tanker safety and extent of any spill such as age, tonnage of oil carried, draft and frequency of use.

On this basis, Indonesia might have to pay a larger share because of its older, more substandard fleet and because of its present oil drilling in the Strait. Singapore might also have to pay proportionately more because more of the vessels using the Straits call at its port.

b. Geography

Allocation on the basis of geographic factors could include consideration of coastline length, area of Straits under a country's jurisdiction, relative hazard in each country's area and the value of resources at risk including livelihoods likely to be adversely affected. Singapore obviously would pay less than its neighbors if coastline length or area of jurisdiction were the criterion. If relative hazard in each country's jurisdictional area were the criterion, Singapore would pay more because of the greater number of ships leaving its port. If resources at risk or people affected were the criteria, Malaysia would pay more to clean up its "front yard" than would Indonesia with its rural Sumatran coastline, or tiny Singapore.

c. Economic position

The United Nations often bases its suggested contributions to its various operations on economic position such as gross national product per capita. On this sole basis, Singapore clearly would be obligated to pay most, and Indonesia would contribute the least.

d. Benefits derived

Some countries benefit more from pollutive activities than others. For example, the refining of oil is a mainstay of Singapore's economy. Singapore also relies on ship repair and construction, as well as logistics supply for the oil industry. Malaysia obtains considerable free benefit because of land-based pollutants from its industry, agriculture, and mining are allowed to enter the Malacca Straits, avoiding some of the cost of pollution control. All three States remove fish from the Straits, and Malaysia and Singapore derive some tourism/recreation benefits as well. Although considerable land-based pollutants enter the Straits from Indonesia, probably it would have to pay less than the others on the basis of derived benefits.

TREND TOWARD PRIVATIZING WASTE MANAGEMENT (Chua et al., 1997)

Privatization of waste management is being pursued by the governments of the Straits States. For instance, the water quality monitoring work for the twelve river basins along the west coast of Peninsular Malaysia, which was formerly carried out by the Department of Environment, was privatized to enhance efficiency. The development of waste management centers (WMC) by private companies to treat hazardous waste in both Indonesia and Malaysia is another example of awareness of the benefits of privatization in this area.

In December 1995, a local company, Kualiti Alam Sdn. Bhd., in a joint venture with foreign partners (Arab Malaysian Development Sdn. Bhd. and Danish Waste Treatment Services) initiated an ambitious project to set up a huge Waste Management Center (WMC) at Bukit Nanas, Negeri Sembilan (New Straits Times, 26 December 1995). Construction of the facility has started and is scheduled to be completed in the next two to three years. On completion, the WMC will have an initial treatment capacity of 70,000 tonnes of hazardous waste per annum. Charges for the treatment, i.e., incineration of the wastes will be RM900 per tonne to incinerate mineral oil, and up to RM7,000 per tonne for pesticides and mercury waste. The Center will have, in one complex, an incineration plant, solidifier, landfill and physical/chemical treatment facilities.

Types of wastes that can be treated and the capacity of the facilities will be as follows:

a. Incinerator plant: mineral oil, organic chemicals, solvents and pesticides; capacity: 30,000 tonnes/year

b. Solidifier: metal hydroxide sludge, spent catalysts, lead/zinc dross; capacity: 30,000 tonnes/year

c. Landfill: asbestos, mineral sludge; capacity: 10,000 tonnes/year.

d. Physical/chemical facilities: acid/alkaline, chromate, cyanide, mercury; capacity: 10,000 tonnes/year.

According to the DOE, the manufacturing industries alone in Malaysia generated 47,000 tonnes of scheduled wastes (toxic and hazardous wastes) in 1994, so this project can clearly accommodate only a fraction of the total waste produced.

Facilities and Services

Transit Services in International Straits

Coastal as well as Straits States have considerable service responsibilities towards the vessels passing their shores. Some services are traditional and others are established by international conventions. Such services include (Mochtar Kusuma-Atmadja, 1994):

a. provision and maintenance of visual navigational aids, including lights, buoys and markers;

b. provision and maintenance of electronic navigational aids, such as radio direction finding, Loran, Decca and Consol;

c. provision and maintenance of the protection of cables and pipelines and other offshore facilities;

d. provision and maintenance of hydrographic and other navigational information, including charts, tidal and current data, sailing directions, notices to mariners and light and radio lists;

e. provision and maintenance of ship-to-shore-to-ship communications systems, including coastal radio stations and satellite communications response systems;

f. provision and maintenance of coastal and marine meteorological services, including weather reporting stations and weather facsimile services;

g. provision and maintenance of coastal and longer range search and rescue services, including medical evacuation facilities;

h. provision and maintenance of offshore security services for the interdiction of piracy, maritime terrorism, narcotic and other smuggling and illegal fishing;

i. provision and maintenance of vessel traffic services, providing active or passive vessel traffic management and information and traffic separation systems; and

j. provision and maintenance of basic vessel salvage and/or emergency repair facilities, including towage services, marine pollution contingency systems and pollutant reception facilities.

The UNCLOS provides coastal States with the power to make laws and regulations covering all of these activities (UNCLOS, 1982) without which shipping would cease to function. However, it makes no provision whatsoever regarding any type of cost-recovery for these very significant coastal and transit services (UNCLOS, 1982)[28]. Only Article 43 provides, in hortatory language, a direction that user States and "States bordering a strait should by agreement cooperate in the establishment and maintenance in a strait of necessary navigational and safety aids or other improvements in aid of international navigation, and for the prevention, reduction and control of pollution from ships."

THE MALACCA STRAITS TRAFFIC SEPARATION SCHEME[29]

The Malacca and Singapore Straits TSS (Malacca TSS) consists of three elements - Traffic Separation Schemes (TSSs), Deep-Water Routes (DWRs), and Accompanying Rules[30]. TSSs, consisting of a separation zone and two traffic lanes, have been implemented at One Fathom Bank, in the Singapore Strait, and in the Horsburgh Light area. DWRs have been approved by the IMO and established within the eastbound lanes of the TSS in the Strait of Singapore (Figure 9). Although the regional States initially opposed any IMO intervention in the creation of a TSS for the Straits, they are now apparently willing to pursue international avenues for resolution of problems. The method pursued by the regional States in adopting a TSS for the Straits is fully in accord with the provisions of the UNCLOS under which states are encouraged to make regional responses to environmental problems, subject to approval by relevant international orgarizations. Adoption of the Malacca Straits TSS by IMO creates an enforceable obligation for vessels to conform to the TSS.

However, the Malacca TSS is an incomplete instrument for eliminating the problem of environmental pollution resulting from the transshipment of oil through the Straits by tankers, or even the more specific problem of casualties resulting from collisions and groundings. The TSS at One Fathom Bank is too narrow and runs through an area with a heavy concentration of fishing vessels (Abu Bakar Jaafar and Valencia, 1985a). Also, shallow areas within the route in the Singapore Strait are dangerous for certain vessels. The Straits contain a significant volume of crossing traffic and vessels that do not conform to the general movement are frequently present in the traffic lanes (Abu Bakar Jafaar, 1984; Noer and

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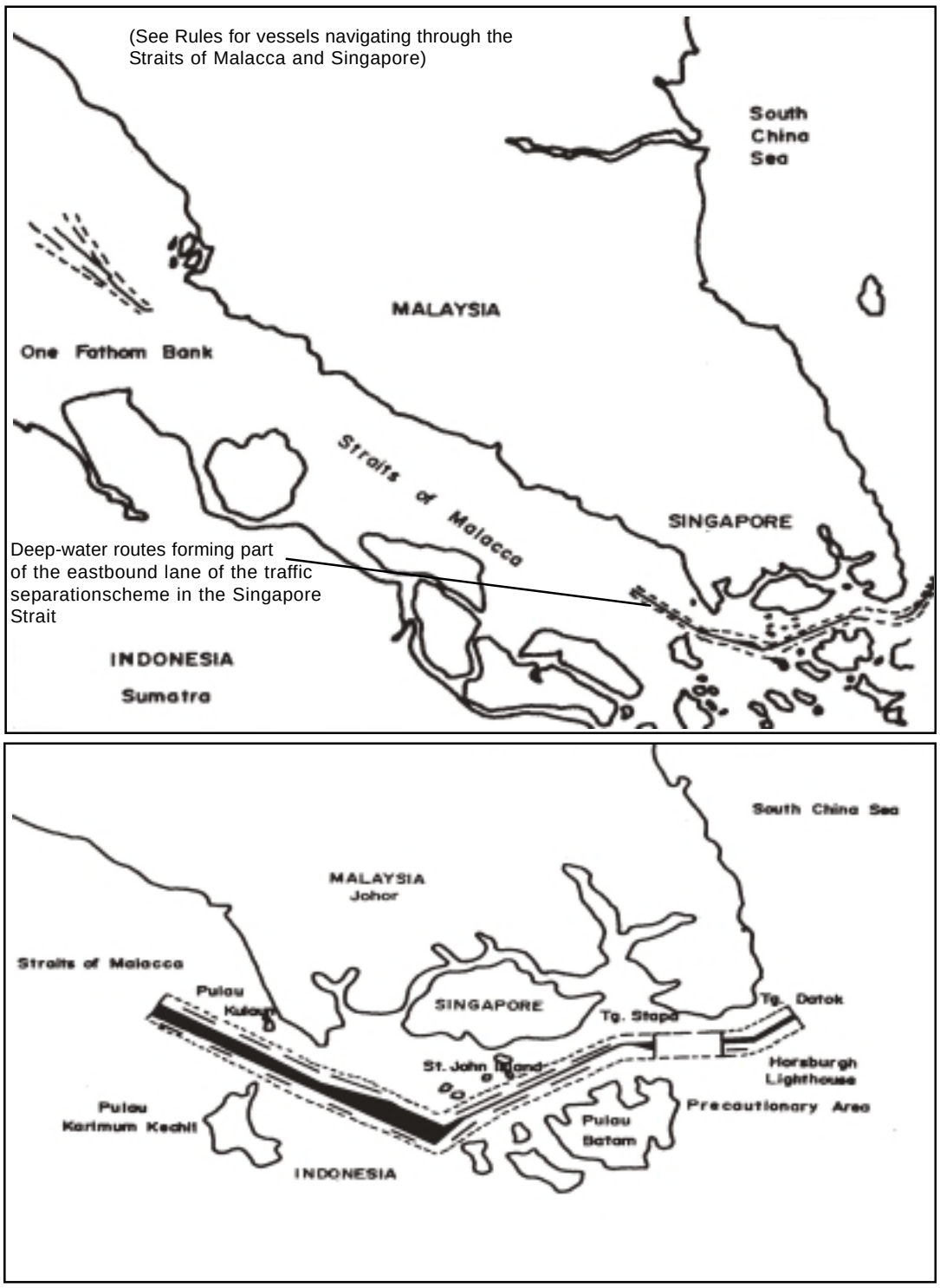
[28] *Art. 26 permits charges to be levied upon vessels passing through the territorial sea but only for specific services rendered.*

[29] *On November 14, 1977, the Traffic Separation Schemes for the Straits of Malacca and Singapore was approved by the Intergovernmental Maritime Consultative Organization (IMCO) (now the Intergovernmental Maritime Organization) (IMO) and implemented on May 1, 1981.*

[30] *IMCO Doc., MSC XXXVII,4 (16 Sept, 1977.)*

Figure 9. Malacca/Singapore Straits Traffic Separation Scheme.



Source: Chua et al. (1997).

Gregory, 1994). Even for those vessels moving in one direction within the defined lanes, the volume of shipping alone will result in many vessels in very close proximity, proceeding along slightly different courses at different rates of speed. Overtaking and crossing will, therefore, continue. Even in the case of VLCCs and other deep-draft vessels navigating DWRs, overtaking is *not* completely prohibited (Finn, 1981).

The rules of the present Malacca TSS are qualified and as such, unlikely to create consistent observance of clear standards. Overtaking and the presence of nondeep-draft vessels in the DWRs are to be avoided only "as far as practicable" (Finn, 1981). Strict observance of designated courses and bearings is not required, even within traffic lanes. Masters are free to draw their own courses. Although masters are advised to be in a state of readiness for delicate maneuvering but no additional radio contact requirements have been adopted. Reporting for VLLCs and deep-draft vessels is now mandatory. Pilotage is voluntary. Many supertankers violate or come very close to the UKC limit. Even though there are both conceptual and practical difficulties in adopting more sophisticated systems of vessel regulation, such systems should be and are being considered.

EXPANDING SHIPPING AND TRAFFIC REGULATIONS

The main causes of ship casualties resulting in pollution in the Straits are groundings and collisions. Improvements in the navigational aids and systems of the three littoral States and the establishment of a TSS in operation since 1980 have reduced the number of groundings, especially of large tankers and deep-draft vessels.

But collisions continue to occur in a sufficiently large number of concern. Collisions have occurred even in well regulated areas such as Singapore harbor, in wide open sea areas in the vicinity of the Nicobar Islands. Examination of these collisions shows that their principal causes are increased traffic and, more importantly, poor seamanship. Rising costs have led shipping companies, especially tankers, to hire less expensive crews, often without the necessary skills or training.

There are three proposed solutions: (a) improvement of navigational aids and the TSS; (b) more stringent requirements for crews of vessels using the Straits, especially large and deep-draft vessels and (c) dealing with the consequences of the increased traffic.

a. The improvement of navigational aids and the TSS

A meeting of officials of the three Straits States in Kuala Lumpur in 1992 concluded that it would be desirable to extend the TSS presently limited to the narrow southern end of the Straits to the whole Straits of Malacca and Singapore. Thus there would be one way traffic in opposite directions throughout the Strait. It was also considered desirable to improve the navigational aids system along both the Indonesian and Malaysian coasts. The actual number of VTS and their exact location

along both coasts necessary to achieve maximum effectiveness are being carefully studied. IMO was consulted after the technical experts of the littoral States concluded their studies and forwarded their recommendations. IMO then approved the extended TSS in 1997.

Additional control mechanisms envisaged are:

1. confirming transiting vessels to the extended TSS lanes;

2. confining inshore traffic to zones provided for the exclusive use of shipping and ships calling at ports of the Straits States;

3. providing designated crossing zones for cross-traffic;

4. a compulsory ship reporting system;

5. prohibiting single man bridge watchkeeping or otherwise requiring pilots;

6. declaration of drafts to designated reporting stations; and

7. mandatory pilotage for vessels that are difficult to maneuver, defective, unwieldy or posing ultra-hazardous risks.

Mariners maintain that compulsory routing schemes such as 'offshore deepwater routes' or 'areas to be avoided' must be used with great caution if they are not to result in increased traffic congestion (de Bievre, 1994). These measures tend to find much favor with environmentalists keen to keep vessels posing a pollution risk away from vulnerable coastlines or sensitive sea areas. Indeed, the United States' unilateral Oil Pollution Act of 1990 indicates that greater use of 'areas to be avoided' and 'tanker exclusion zones' may be expected.

However, mariners point out that while such measures are aimed at reducing the risk of groundings in environmentally high-risk waters, they may instead increase the risk of collisions by causing the unnecessary bunching of traffic in offshore waters just outside the prohibited areas. Furthermore, vessels, especially smaller ships, often need the proximity of land in order to check their bearings. For these reasons, they argue that such measures should be voluntary. An additional problem is the difficulty in determining at what distance ships should be required to join mandatory traffic routes. 'Areas to be avoided' may be mandatory but that would still leave ships the choice of which routes to follow to circumvent designated prohibition zones.

b. More stringent requirements for crews of vessels using the Straits, especially large and deep-draft vessels.

Although the need for better quality crew for vessels using the Malacca and Singapore Straits is obvious, it is equally obvious that this recommendation is not easy to implement. Assuming that priority attention should be given to large and deep-draft vessels, the first difficulty is that the littoral States can only make increased requirements compulsory for vessels flying their own flag. However, most large and deep-draft vessels in transit through the Straits of Malacca and Singapore are foreign flag vessels. Therefore, the Straits States must persuade IMO and the foreign flag nations that on the basis of the risk of collision in the Straits of Malacca and Singapore, more stringent requirements for the crewing of large and deep-draft vessels using the Straits should be adopted. Moreover, the more stringent requirements for crewing cannot be applied to local coastal vessels as this would create undue hardship for many local people who have been traditionally plying the waters of the Straits of Malacca and Singapore. While it is desirable to make such distinctions, in proposing regulations, littoral States should be careful to avoid charges of double-standards and discrimination.

There are certainly benefits to be gained from ship identification and reporting measures, especially with respect to vessels sailing outside waters that have shore-based radar surveillance cover. Anonymity can be "a positive encouragement to wrong-doing". However from the mariners' viewpoint, it is important that mandatory traffic rules such as compulsory participation in ship reporting systems and compliance with mandatory ships' routing measures do not unnecessarily increase the workload on the ship's bridge or reduce safety.

c. Dealing with the consequences of the increase in volume of traffic through the Straits.

With continued economic growth in the region, the volume of traffic through the Straits of Malacca and Singapore will also continue to increase. The Singapore-Johore-Riau economic growth triangle and development of Bintan Island are bound to result in increased shipping, especially in the Singapore-Riau area. The Penang-North Sumatra-Southern Thailand growth triangle will also result in increased shipping. Already, there is an increase in cross-traffic between Malacca and Batu Pahat and between East Sumatra and the west coast of the Malay Peninsula adding to the complexity of the traffic pattern.

While the routing of local and coastal traffic will remain the responsibility of the navigation and sea communication authorities of the three coastal States, the routing and regulation of traffic crossing the Straits as well as that of regional traffic involving more than one country will require their close consultation, cooperation and coordination. The density of cross-channel traffic is still minimal compared to transit traffic, and consists largely of fish carriers and tongkangs loaded with mangrove poles and charcoal.

However, there are obstacles to tri-State cooperation in the regulation of cross-channel traffic. Singapore continues to object to the long-proposed cross-lanes in and near its waters on the grounds that transit traffic and thus its business could be diminished.

VESSEL TRAFFIC SERVICES

There are precedents from other parts of the world for the monitoring of shipping traffic, including, that in straits used for international navigation, such as the Dover Strait and the Cattegat entrance to the Baltic Sea. A a vessel traffic sytem (VTS) is basically a traffic management system designed to influence the behavior of traffic in a given area and, as such, it aims to contribute to the shipboard decision-making process in the interests of navigational efficiency, safety and marine environmental protection. The key feature of a VTS is the interaction that takes place between the shore-based VTS operator and the watchkeeper navigator on the ship's bridge.

A VTS responds to a given traffic situation through information exchange and this response may take the form of a simple message, advice or a binding instruction. A VTS can be a very simple system based on radio communications and does necessarily involve radar surveillance support. Even in those areas where shore-based radar coverage of coastal waters or enclosed seas is possible, the effectiveness of radar surveillance depends on the technically reliable identification of radar echoes. At present reporting is voluntary and those vessels that do not report are just nameless dots on the radar screen.

There is no agreement on the legality of mandatory VTS which affect foreign ships exercising their right of innocent passage, freedom of navigation or transit passage through Straits. The major problem is the absence of any express provisions in international law on VTS, whether in customary law or in international conventions. Whereas the UNCLOS makes explicit reference to TSS, it does not refer to VTS. The reason is that the coastal VTS concept was relatively new when the navigational provisions of the UNCLOS were negotiated. Nevertheless, many experts believe that VTS applicable to ships navigating outside territorial waters can not be enforced mandatorily on the basis of current international law.

A special working group of the IMO's Legal Committee on the legal aspects of VTS affecting international shipping, reported to the Committee in February 1993, that it could come to no firm conclusions on the legality of requiring mandatory participation in VTS-based ship reporting systems in international waters. The Legal Committee, at its March 1993 meeting, concluded that "there were simply too many variations on the factual circumstances for a single legal conclusion to be definitive", and that "there were also too many different interpretations of existing law for a single response to be both complete and useful".

Nonetheless, most delegations endorsed in principle the proposal to choose the 1974 Safety of Life At Sea Convention (SOLAS 74) as the vehicle for the introduction of provisions for mandatory VTS-based ship reporting systems. A special working group of the IMO's Subcommittee on Safety of Navigation reported to the May 1994 meeting of the Maritime Safety Committee, which considered adoption of amendments to SOLAS pertaining to mandatory ship reporting requirements. With this background, it is unclear if a VTS for the Straits of Malacca and Singapore could impose binding requirements on foreign ships in transit, requiring them, for example, to identify themselves, give their positions, maintain certain speed, take part in mandatory reporting systems, or comply with compulsory pilotage or tug assistance requirements. It may well be that a workable solution to these issues would require the littoral States to conclude a specific multilateral agreement with major user States.

One caveat for the coastal States, while it is true that under existing international maritime law, the shipowner remains liable for mistakes made by the ship master or the pilot on board, there is a growing recognition that this principle does not exclude the liability of coastal State authorities engaged in traffic control activities. They could indeed incur liability, either because of their duty under common law or through special enabling legislation enacted nationally in those countries where shipping traffic management is centrally organized.

It will not be possible to achieve clarity over the legal issues involved unless there is an international, harmonized approach to the regulation of maritime traffic safety. Only common rules and common procedures can lay the foundation for a common understanding of questions of responsibility and liability. This probably means that traffic control such as mandatory ship reporting and VTS schemes will have to follow precisely defined quality standards, such as formal training of system operators, written procedures and auditing systems for verifying that training requirements and written procedures are being followed.

Marine Electronic Highway

The marine electronic highway (MEH) is an important new concept which, when implemented, will revolutionize maritime traffic management, greatly improve safety of navigation and in the long term, may save money (Macdonald and Anderson, 1997). The MEH is a network of electronic navigational chart (ENC) datasets which enables ship board guidance and computer systems to fully benefit from the worldwide advances in positional information generated by global positioning systems. The highway represents a suite of emerging technologies including geographic information systems, digital hydrography and ocean mapping, as well as timely transmission of water level and current information to underpin the navigational decision making of mariners. The underlying network of ENC databases is based upon approved international standards developed by the International Hydrographic Organization. ENCs support and enable the use of precise navigation technologies-the electronic chart display and information systems (ECDIS) and the differential

global positioning system (DGPS)-for precise continuous navigation. It represents the integration and networking of ENC databases with telecommunication technologies, as well as real time water level and current information.

ECDIS is the specific title for the system specifications that have been approved by IMO. Perhaps the best testimonials for ECDIS come from the most well-known Canadian commercial user, Canada Steamship Lines (CSL). In 1996, Captain John Pace, Director, Navigation, Ports and Safety for CSL wrote:

> *"The arrival of ECDIS on the bridge of a ship is a singular event without precedent for the modern navigator. ECDIS is not just another incremental improvement in navigation technology. Rather, it signals a quantum technical leap that will provide the navigator with new functionality.*
>
> *It is the unique ability of ECDIS to integrate vast quantities of data for high speed computer processing and analysis prior to real time display on an electronic chart that spells the difference between ECDIS and traditional navigation instrumentation. ECDIS performs the navigation information gathering and computational tasks automatically and with high accuracy. This frees the navigator from the time consuming and error inducing task of collecting data from internal and external sources over a period of time. Instead, the navigator can concentrate on making navigation decisions based on information presented in a manner optimized to support the intended navigation plan.*
>
> *By bringing together up to date navigation information and data resident in onboard databases, imported from the vessels onboard sensor or downlinked from external sources, ECDIS is capable of supporting a technical systems approach to navigation.*
>
> *Sea trials with ECDIS under the most demanding conditions imaginable have consistently demonstrated that electronic charts and differential GPS are technically capable of delivering a high degree of precise sustained navigational performance that is not considered achievable with traditional methods.*
>
> *Finally, ECDIS will relentlessly compare database and sensor information against the vessels' safety parameters and alert the bridge team in the event of a safety margin violation. By providing highly accurate real time navigation information to the bridge team, ECDIS will help the navigators to stay ahead of the passage plan. ECDIS will reduce the workload on the bridge and improve the quality of navigation decision- making in all weather."*

And from users in San Francisco:

> *"ECDIS will improve marine transportation efficiency and reduce risk of collisions and groundings in the San Francisco Bay region. The implementation of electronic chart technology aboard commercial ships, particularly when integrated with real-time current and water level information, will allow maximum safe-ship drafts to be used, reduce delays in ship arrivals and departures, and allow larger ships and increased levels of commercial traffic to more safety transit in the Bay region. Electronic chart data will also contribute significantly to the upgrade of the San Francisco vessel traffic system."*

ENCs permit the user to make current, tide, wind, siltation and water level data interactive and three dimensional by using ECDIS. The MEH is the integration of telecommunication technologies, ECDIS and ENCs as well as the transmission of real time water level and current information.

Until recently the acceptance of ECDIS has been constrained by the lack of international standards. The development of ECDIS Performance Standards was undertaken by a joint IHO Harmonization Group and in late 1995 the IMO Assembly adopted the necessary standards. An updating service would be provided by each Hydrographic Office (HO) and the updates would also be integrated as regional packages and delivered to customers. Revenues from sales by regional centres would be redistributed back to the HOs providing the data, less overhead and costs borne by the regional centre. Eventually, all regional centres would be linked so that data and services for any area covered by a regional centre would be available at any other center.

Mobile data communications will be required on vessels using the MEH to receive ENC update information as well as real-time water level and current information. Vessels that add the small incremental cost of transponders will be able to transmit position information to shore-based MEH facilities, as well as receive position information of other vessels in the area and display the information on ECDIS, supplementing radar information.

Although this is a large task, the financial paybacks for the shipping community could prove quite attractive. For example, it is possible that the combination of precise ENCs and timely water level information could enhance the margins of safety in the Malacca Straits, and enable carriage of larger loads well within safe limits. If this possibility can be developed into reality, then significant increases in revenues to shippers and cargo owners can result, giving rise to a potential revenue source, part of which could offset the costs of production of the infrastructure. Because most MEHs traverse the waters of many nations, as well as international waters, infrastructure building and financing are international challenges that will require the participation and cooperation of several nations, as well as ship and cargo owners.

Results of tests show:

a. increased safety;

b. increased profits through a year of incident free operations, longer hours of work in adverse conditions, operating when the traditional aids to navigation were removed or had malfunctioned; and

c. decreased costs of insurance (through increasing the deductible portion of ship insurance).

The implementation and enforcement of international safety rules is complex and time consuming. Therefore the voluntary compliance of the shipping industry, in implementing precise navigation technologies, would be more effective. This can be more easily achieved if the shipping sector can see increased profitability as a probable result. This in turn, requires international cooperation to develop global port to port ENC services of the MEH that allow the companies to maximize their efficiencies and increase their profits, as well as improve safety.

National highway sections should generate revenues to repay investors, public or private, and not simply rely on the general tax revenues of the various nations. In theory, nations should be able to construct and maintain valuable information infrastructure vital for environmental management and protection, at very little, if any, ultimate cost. The ability to maximize loads safely, the ability to navigate precisely, the potential cost savings of automatic updating, and the potential for decreased insurance costs are all important factors. For some owners, the network need only be within a certain region, or between certain ports within a region to attract their interest. For others, it must ultimately become a global port to port service.

The "construction" costs of producing reliable ENCs, including the gathering of additional hydrographic data where necessary, are generally an undertaking which national authorities finance. If the States have the financial resources and have prioritized the ENC production, only the incremental costs of networking those databases would be necessary. The Global Environment Facility (GEF), a two billion dollar grant facility, and its International Waters Protection Section are committed to assisting in the reduction of barriers to new environmentally friendly technologies. It is probable that the GEF will look favorably upon assisting with the necessary costs of developing a regional network management capability. However, the GEF provides only incremental finance, meaning that the highway nations will need to address the financial issues of their highway sections.

Some nations, however, may still not have the financial resources to get started, and here, private sector funding may be possible in the context of a larger business plan. The

public-private sector partnership approach may be the most cost-effective means of delivering the services. It allows the government agencies to maintain control of the data and ensure quality control of the ENCs while allowing the flexibility of the private sector to customize and maximize services for the market place and therefore, revenues. The revenue sharing agreement is determined within each of the partnerships that together comprise the MEH. Nevertheless, GEF grant participation would certainly assist in making a business case more financially feasible.

A coordinated regional and global strategy is needed to assist national authorities in encouraging the adoption of necessary technologies by domestic shippers, in entering into the necessary international cooperation agreements to share data and in creating an inviting legal framework by which private investment can be securely attracted.

Environmental and resource managers normally have limited resources to gather and manage multidisciplinary data. Often the ability to keep databases updated and therefore relevant expires simultaneously with the end of project funding. By tying electronic chart infrastructure to environmental and sustainable development infrastructures, it may become possible to develop a financially sustainable plan to maintain the underlying databases for several user communities.

Finally, intentional oil spill pollution, often in the form of improper bilge pumping, is also a serious environmental problem IMO is working to meet parts of this challenge with the Port State Control system. The system will allow inspection information to be readily exchanged between nations to assist in verification that improper discharges have not been called out. The highway infrastructure will be a valuable tool in augmenting the Port State Control system.

When the MEH is built, the transportation community will use it. This has been the case in Canada. The acceptance of the shipping sector required the demonstration and experience gained by the early adopters, such as Canada Steamship Lines. Once private sector confidence was established in the value of the new technologies, the response was compliance. The Canadian experience is instructive and it hopefully will progress.

The empowering of mariners with better data and information by which to increase operational efficiencies is a means to attract voluntary compliance by the shipping sector. Those that do comply will be developing a competitive advantage over those that do not. A voluntary compliance approach is more likely to succeed in a meaningful time frame than is the laborious imposition of regulatory controls which do not add to the shipping community's profitability.

The financing of an MEH still needs to be evaluated in light of a business plan that credibly addresses issues, such as capital and operating costs along with well thought out revenue projections. The support of national authorities responsible for international

cooperation will also need to be gained with assurances that the databases will remain as national property and with royalty revenues paid to the contributing nation for data usage after operating costs and debt service are factored in. The most important element of the business plan is the probability of revenue generation sufficient to maintain operations and, after a start up period, retire debt or pay dividends. If the oil tanker and cargo owners of the region become convinced that the use of ECDIS equals increased profitability then they will pay for the services.

CONTINGENCY PLANS (Chua et al., 1997)

National Plans

In Indonesia, as an intermediate step prior to the establishment of a national contingency plan, the Directorates General of Sea Communication and of Oil and Gas cooperated in the formulation of "Permanent Procedures on Marine Pollution Control in the Malacca/Singapore Straits" (PROTAP). The procedures were effective starting 18 September 1975 within the limits of the Indonesian territorial sea in the Straits.

Singapore has developed an Emergency Plan to combat a major oil pollution disaster. Its principal function is to ensure that sufficient stocks of floating booms, skimming devices and detergents are available and ready for delivery to the site of the emergency. Procedures are set forth to cover major pollution events, including collisions and groundings, as well as to deal with fire hazards. Operations of each unit have been defined and coordinated within the system, and a sophisticated manual for all personnel involved has been developed (PSA, n.d.).

The Malaysian plan assumes that daily traffic through the Straits will increase beyond the present level of 140-150 vessels. The anticipated increase in oil volume transshipped through the Straits will raise the probability of casualty to more than 25% per year. The plan describes the serious consequences of accidents and sets forth a plan of action calling for the establishment of three area headquarters—at the port of Johore Balini (South), Port Klang (Center), and the port of Penang (North), each headed by an Area Coordinator (the Harbor Master)[31]. Each area would be self-sufficient in equipment, facilities and trained personnel. In the case of a minor oil spill, the Area Coordinator would be responsible for all control efforts. When major oil spills occur, however, the Royal Malaysian Navy, assisted by the Area Coordinators, would take charge. A plan of operation is spelled out, responsibilities

[31] *Malaysia Ministry of Science, Technology and Environment, Straits of Malacca Contingency Plan at 2(n.d.). The Ministries of Defense, Communication, Agriculture and Rural Development, and Foreign Affairs; the Departments of Royal Customs and Excise, Marine Police and Immigration; and five resident oil companies (Esso, Shell Caltex, BP, and Mobil) cooperated with the Ministry of Science, Technology, and Environment in formulating the contingency plan for the Malacca Strait. The plan was endorsed by the Malaysian Cabinet in June 1976. The plan was revised and updated to include search and rescue and information on environmentally sensitive areas and integrated with the Oil Spill Contingency Plan for the South China Sea to form the National Oil Spill Contingency Plan (NOSCP).*

are designated, and the required equipment is listed. An essential requirement of successful implementation of this plan is speed of action to prevent oil from reaching the vulnerable beaches and mangrove forests along the coastline (Finn, 1981). Malaysia's contingency plan calls for handling and clean-up of oil by mechanical means. The use of dispersants is reserved for cases of absolute emergency because the chemicals used to disperse oil are considered hazardous to marine organisms.

ASEAN Contingency Plan

The intent of the ASEAN Contingency Plan is not to duplicate national efforts but to coordinate and integrate the efforts of the member countries. The plan provides for effective reporting to alert member countries, creating awareness of the anti-pollution capabilities of the member countries, and rendering assistance in operations where and when necessary. The capabilities of each member country are recorded, and contact points are established within each country so information can be disseminated rapidly and requests for assistance dealt with efficiently (Finn, 1981)[32]. Potential pollution problem areas are described, including high density shipping lanes, offshore oil exploration and production centers, coastal tourist and recreational areas, fish spawning areas and fishing grounds. The plan also records the location of resources for marine oil pollution control and shore reception facilities, as well as information on winds, currents, tides and other meteorological data. It describes operational procedures, recommends appraisal of operations after each incident and provides for review and amendment of the plan with the concurrence of all member countries, as the need arises. Additional suggestions include the opening of the plan to interested non-ASEAN parties as associate members.

HARMONIZATION OF MARINE ENVIRONMENTAL POLICIES AND REGULATIONS

The Straits States have yet to harmonize their respective strategies or specific regulations for marine environmental protection and preservation. And no Straits States has yet introduced all the necessary legislation required by the UNCLOS (Abu Bakar Jafaar and Valencia, 1985b).

Singapore has adopted a single set of uniform effluent standards. Also, polluters are encouraged to utilize the state-run waste-water treatment plants. By utilizing these services, polluters are not required to fully treat their waste-water and thus save some costs. Malaysia has introduced a mixed strategy, issuing two sets of uniform standards for treated sewage and industrial effluents, and prescribing its agro-based industries, namely, palm oil and rubber. Indonesia has contemplated adopting a multiple-set-of-uniform standards strategy by issuing four sets of uniform standards for discharges into four types of water bodies.

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[32] *The contact points are Jakarta: Directorate General of Sea Communications; Kuala Lumpur: Directorate General of Environment; Manila: National Operations Center for Oil Pollution; Singapore:Maritime and Port Authority of Singapore; and Bangkok: National Environment Board.*

In short, each country has adopted a different pollution control strategy: Malaysia, mixed uniform standards; Indonesia, multiple uniform standards; and Singapore, single uniform standards (with treatment options). Table 29 compares the specific standards for effluents discharged into watercourses other than those used for water supply. In comprehensiveness and strictness, Singapore ranks generally higher than Malaysia which, in turn, ranks higher than Indonesia.

The environment of the Straits continues to deteriorate, producing real and imagined costs to the three littoral States. The three littoral States could cooperate in the setting and enforcement of pollution standards. Such harmonization of pollution control practices and regulations could ultimately benefit all States. The States would be required to reexamine the rationale for their laws and to develop new ones or modernize and streamline those which are outdated and disconsonant. Any differential in foreign investment resulting from diversity in environmental legislation could be reduced as could any attendant conflict. Similarly, harmonization could avoid conflict due to one country's lower standards leading to pollution, which damages resources shared by all three. Harmonization could also eliminate the question of which nation must control its pollution first, and could strengthen the legal position of each state vis-à-vis external users.

However, this would be difficult due to different standards and perspectives. The countries are at different developmental stages and therefore, presumably have different environmental protection priorities and capabilities for enforcement. Furthermore, uniform laws and standards preclude a differential approach within each country.

Singapore, with the strictest effluent standards of the three, would probably support harmonization of pollution control practices and regulations, because it would benefit, through, e.g., increased tourism and enriched fisheries, or enhanced fish supply. Malaysia might favor the arrangements because its "front yard" could be cleaner as a result. On the other hand, it may be wary that it could be determined that Malaysian industry, agriculture and mining would be determined to contribute most of the land-based pollutants and that further pollution control may economically constrain these industries. Further, Malaysia might have to introduce and/or upgrade some standards to match those of Singapore. Malaysia's choice of emphasis on pollutants and areas of control could thus be limited.

Indonesia probably would not favor this approach because its laws are the fewest and its standards and/or enforcement the weakest of the three States. In effect, its priorities, its Dutch-based legal system, and its regulations would be strongly influenced by its economically better-off, British-influenced neighbors. Further, Indonesia has the largest area of responsibility and the pollutants most difficult to control, such as siltation from extensive logging. Most importantly, Indonesia has the only oil and gas production in the Straits. Because oil and gas are a mainstay of its economy, Indonesia may believe that its development should not be hampered in any way.

Table 29. Effluent Standards for Point Sources or Discharges into Rivers or Open Watercourses that Eventually Reach the Ocean.

Type of waste	Item of Analysis	Unit	Indonesia[a]	Malaysia[b]	Singapore[c]
Oil	Oil and grease	mg/L	100	10	
Organic	BOD5 at 20°C	mg/L	300	50	50
	Total suspended solids	mg/L	ns	100	50
Metals	Tin	mg/L	ns	0.1	1.0
	Barium	mg/L	ns		5
	Manganese	mg/L	ns	1	5
	Arsenic	mg/L	1	0.10	1
	Metals in total	mg/L	ns		1
	Chromium	mg/L	5*	0.05*	
	(total)	mg/L		1	
	Nickel	mg/L	ns	1	1
	Zinc	mg/L	10	1	1
	Beryllium	mg/L	ns		0.5
	Selenium	mg/L	ns		0.5
	Cadmium	mg/L	1	0.02	0.1
	Copper	mg/L	5	1.0	0.1
	Lead	mg/L	5	0.05	0.05
	Silver	mg/L	ns		0.1
	Mercury	mg/L	0.1	0.05	0.05
Thermal	Temperature	°C	45	40	45
Others	Total dissolved solids	mg/L	ns	ns	2000
	Chloride(Cl)	mg/L	ns	ns	600
	Sulphate (SO_4)	mg/L	ns	ns	500
	Chemical oxygen demand	mg/L	600	100	100
	Calcium	mg/L	ns	bs	200
	Magnesium	mg/L	ns	bs	200
	Iron	mg/L	10	5	20
	Detergents (as methylene blue)	mg/L	ns	bs	15
	PH value		5.5-10.0	5.5-9.0	6-9
	Color (LU)		ns	ns	7
	Boron	mg/L	ns	4.0	5
	Chlorine	mg/L	ns	2.0	1
	Sulphide (S)	mg/L	2	0.5	0.2
	Phenolic compounds	mg/L	0.5	1	0.2
	Cyanide (as CN)	mg/L	ns	0.10	0.1
	Fluoride (F)	mg/L	2	ns	ns
	Ammonia (free)	mg/L	2	ns	ns
	Nitrate	mg/L	ns	ns	ns
	Nitrate	mg/L	ns	ns	ns

ns=not specified; *-Cr(VI)

Sources: [a] Badruddin Matibub, Kriteria Mutu Lingkungan Hidup Air, Rapat Keria Nasional Linkugan Hidup, 4-5 Han. 1979; Kantor Meneri Negara Pengawasan Pembangunan Dan Lingkungan Hidup (1979).

[b] Government of Malaysia.

[c] Science Council of Singapore.

Conclusions and Recommendations

Management of pollution in the Straits must address four main problem areas:

a. minimizing land-based pollution;

b. enforcement of regulations for controlling vessel-based pollution;

c. combating oil spills; and

d. repairing environmental damages and implementing claims for compensation.

VESSEL-BASED POLLUTION

The major problems with regard to vessel-based pollution are (Mochtar Kusuma-Atmadja, 1994):

a. an aging fleet, with about 20% below international standards;

b. a shortage of competent seafarers;

c. low freight rates; and

d. failure to adhere to existing safety regulations.

Flag State Control has failed because the flag countries impose compliance with the relevant IMO conventions only on ships registered under their flag and many are unwilling or unable to enforce such compliance. Poor watchkeeping standards are the result of lack of compliance with STCW 1978 and classification societies contribute to substandard ships through poor surveys. Because of the failure of flag State control, the IMO is now promoting Port State Control.

But the solutions lie both with the flag State and the coastal or port State. The flag State should:

a. improve the accountability of its administration of IMO delineated responsibilities;

b. tighten links between ship owners and the country of registry;

c. tighten IMO manning, training and certification regulations; and

d. improve control of surveys by classification societies.

Regarding financial contributions, China, Republic of Korea and Taiwan should follow Japan in contributing to the control of oil pollution arising from their use of the Malacca and Singapore Straits. They should contribute to the Revolving Fund established with the assistance of the Malacca Straits Council, and they should participate in the oil spill response programs either in cooperation with the governments of the three littoral States or in cooperation with programs such as EARL.

The coastal or port States should:

a. target inspections based on high risk features of vessels like age and accident records;

b. expand the frequency and scope of inspections;

c. strengthen sanctions against deficient ships;

d. publicize ship inspection deficiencies and inquiries into ship casualties;

e. ratify IMO compensation schemes regarding oil pollution;

f. demand the overhaul of mechanism for speeding payment of compensation under IOPCF;

g. ratify and implement the relevant shipping conventions and protocols; and

h. enforce MARPOL 73/78 discharge provisions more rigorously.

The international shipping community is willing to support efforts to enhance navigational safety in the Straits but its offer of cooperation is contingent on revision rates by littoral States and a promise of non-discrimination. This highlights the dilemma facing the Straits States. Needed is an acceptable, non-discriminatory funding mechanism for establishing a cooperative arrangement without surrendering control over the management of the Straits. The key is to develop a revenue collection system in consultation with the IMO and the stakeholders which is based on cost-recovery services rendered rather than profit making or punishment. Perhaps two funds are necessary—one for improving safety of navigation and another for environmental management. An environmental management fund is likely to be much less contentious than a fund for improving safety of navigation. Indeed the Straits States have already received voluntary contributions and technical support

for management of the Straits environment. More controversial would be a counter-pollution fund to cover, e.g., emergency towing, or the establishment of a counter pollution capacity.

POSSIBLE COOPERATIVE APPROACHES

A joint approach by the Straits States would ideally focus on several areas where the States have major individual interests but where these interests are likely to be more effectively promoted by collective and harmonized action. Such areas include the following:

a. The employment, establishment and operation of enhanced VTS. The increasing levels of maritime transport in the region means that each of the States needs to establish a working system for the regulation of shipping entering its ports and other installations. In view of the proximity of these ports and the likelihood that they will be used by the same vessels, it makes sense for the systems which are adopted for various ports to be harmonized as far as possible. Such harmonization will be in the interests of the States, and also to the advantage of the ships utilizing the system.

   The VTS must be reflected as a service to facilitate safety for the benefit of users of the Malacca Straits. Enforcement, with penalties, must be carried out against ships that do not comply with the routing system and its regulations. Since the radar surveillance footprint will overlap international boundaries, an understanding will have to be reached between the Straits States on certain management aspects of the VTS. An integrated VTS should be developed with the lead agency's role and responsibilities clearly defined to avoid duplication of effort.

   The establishment of TSS and other routing systems. Considering the process stipulated by the UNCLOS for designation of sea-lanes, it is not merely desirable but imperative that the States in the area develop a common approach for the establishment of routing systems for approval by IMO. Any other approach will make it difficult for the proposals to be adopted since the approving bodies as well as the affected operators will want to be assured that the different systems will not cause avoidable complications and unnecessary costs. A mechanism under which the interested States cooperate in the formulation of systems based on uniform or common principles and policies will make the process simpler and less controversial.

b. The following routing system should be considered. Traffic and routing patterns for regional traffic should be planned and developed based on existing patterns and economic needs. The planned development of Karimun Island developed by Singapore, including an oil refinery complex with attendant ship-berthing and storage facilities should help alleviate tanker traffic in the Singapore Strait and lessen the dangers of pollution in the Singapore Port area. Through traffic using the narrow eastern end of the Straits (Philip Channel) should be restricted to traffic bound for Southeast Asia, East Asia and Northeast Asia (Mochtar Kusuma-Atmadja, 1994).

Through traffic destined for Indonesia, except for Bintan Island should use the Straits between Karimun Island and Rangsang Island, on to Berhala Strait, and from there on through the Bangka Straits to the Java Sea. Traffic originating from Western Europe or South Africa destined for Indonesia or Australia could use the route along the west coast of Sumatra to the Sunda Straits. Eventually, re-routing or diversion within the main body of water comprising the Straits and the Riau Islands may no longer be sufficient. Consideration should then be given to the diversion of shipping destined for Indonesia and East Asia through other waterways or Straits.

c. The cooperative development of arrangements which will provide appropriate incentives to ships using the Straits of Malacca and Singapore to respect and observe the laws and regulations of the various bordering States regarding the conservation of marine resources, the protection of the health and welfare of the coastal population, and the promotion of policies on customs and immigration.

d. The cooperative development of procedures to protect shipping from unlawful acts such as piracy and other violent acts against persons and property on ships in the area.

e. Regarding shipments of ultra-hazardous high-level radioactive waste, all concerned coastal and island nations should bring concerted pressure at the IMO to develop a comprehensive and binding legal regime governing such shipments. This regime should include, as a minimum, the following elements.

1) the obligation to notify and consult well prior to any shipments of high-level radioactive wastes through the territorial sea or EEZ of any other nation. Consultations must be held in good faith, and must include discussions regarding alternative routing and emergency contingency planning.

2) the requirement of the informed consent of potentially affected states for any transit of ultra-hazardous radioactive waste through their territorial waters or EEZ;

3) the requirement to prepare an environmental impact assessment prior to such shipments. The process of preparing the assessment must be interdisciplinary and must include public input;

4) a binding liability and compensation regime. Such a regime must not only spell out the conditions of liability, but should also include the creation or identification of a compensation fund to pay any victims of accidents;

6) the exclusion of certain specific high risk routes; and

7) detailed provisions on accident and emergency procedures. These procedures must include access to appropriate ports, availability of tugboats and firefighting equipment and plans for retrieval in the event of a sinking.

Concerned nations should also consider bringing a claim against Japan and France using the dispute resolution procedures of the UNCLOS. Such a claim would argue that the shipments of ultra-hazardous high level radioactive wastes violate the Convention's requirements obligating the shipping nations to prepare an environmental assessment and to notify and consult with affected nations. No cases have yet been brought under the UNCLOS, but the new UNCLOS provisions provide strong support for the substantive claims of concerned coastal States and a decision in this case could clarify the law and reinforce the position of the coastal nations that they are justified in taking steps to protect their coastal and marine environments. Until this new regime is fully developed, affected nations are likely to take unilateral or regionally coordinated action to protect themselves against these shipments, including taking measures to keep the ships out of their territorial seas and EEZs.

f. The establishment of coordinated arrangements for the enforcement of a national and international standards for environmental impact assessment. For example, the three States could develop a common methodology for assessing impacts which could include baseline surveys and resource, risk and damage assessments at pre- and post project development stages as well as assessment of impacts due to accidents. Such investigations could be planned and/or coordinated internationally but implemented on a national basis. Navigational aids could also be maintained and funded on a regional basis as encouraged by the Convention.

g. Maintaining the integrity of the Straits of Malacca and Singapore as safe and clean international waterways can only be achieved if management measures are taken to regulate and reduce the inputs of pollutants to the Straits. Management measures should include: (1) integrated coastal management programs, applied at the local government level to address marine pollution from land-based sources; and (2) sustainable, marine pollution prevention and management policies, strategies and action plans to address marine pollution arising from sea-based activities. The latter action need to include the ratification and implementation of marine pollution conventions, especially those of IMO.

h. The Straits States should establish an effective marine pollution monitoring mechanism and appropriate protocols so that the monitoring results from the three littoral States can be compared and used for management interventions, and there should be more effective port State control of all vessels. But this will entail the necessary waste reception facilities in the ports.

i. Information about the state of the marine environment of the Straits of Malacca and Singapore is far from complete. Despite hundreds of reports and publications on the Straits, relevant information on environmental conditions and shipping traffic are not adequate and readily available to support detailed management planning and interventions. A concerted effort among the littoral State is necessary to pool available information for the design and development of an effective subregional program action plan to be participated in by both the littoral and user States.

j. A dynamic atlas for marine policy making is needed for the Malacca Straits. Such an atlas would be an expanded GIS-a computer database rather than hard copy and it would be capable of generating and printing out maps of variables on command. The variables could be selected based on the immediate need, e.g., an oil spill at a particular site. An econometric valuation model could also be attached to or integrated into the database. The main categories of variables might include:

1) the natural environmental setting: bathymetry, surface currents, surface temperature, nutrients and productivity;

2) scientific research: research coverage for physical, chemical, biological and geological oceanography;

3) maritime jurisdiction: boundaries, jurisdictional regimes;

4) vulnerable resources: endangered species, scenic coastal areas, marine parks and preserves, research stations and aquaculture sites;

5) shipping: important ports, shipping routes, traffic (by vessel type and flag) and maritime casualties;

6) non-living resources: hydrocarbon and mineral potential for exploration and leases and geological characteristics

7) fisheries: distribution of chief commercial species, migration patterns, catch statistics and geographic distribution, fisheries infrastructure and fishing agreements;

8) pollution: sewage and chemical oxygen demand, hydrocarbon pollution, hypothetical oil spill trajectories, ocean dumping, heavy metals, and pollution standards.

These variables could be superimposed on each other in integrated outputs to identify areas of special concern, e.g., all vulnerable resources and all pollutants, shipping and vulnerable resources, fish distribution or catch and pollutants. A carefully

designed and coordinated program of monitoring of ecological resources should be developed and fed into this database for the Straits. This is why the formulation of risk assessment/risk management framework by the GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas-Malacca Straits Demonstration Project is so timely and significant.

Lessons Learned and Measures Being Considered

The *Evoikos* spill and its aftermath produced some valuable lessons and became a catalyst for conception and implementation of new measures to ensure safety in the Straits (Hussain, 1997; Teo, 1997; Seafarer, 1997).

Lessons learned from this unfortunate incident include the following:

a. Competent and disciplined crew and masters are the key to accident prevention. Adequate training is a necessary, but not sufficient qualification. Good character and discipline are equally important.

b. The implementation of the contingency plan generally went very well because it was well-rehearsed, and the staff were dedicated and committed, however some Malaysian-owned equipment broke down.

c. Singapore's computer modeling system was able to accurately predict where the spill would come ashore thus enabling the staff to focus their protection efforts in those areas (The New Straits Times, 18 October 1997). On the other hand, MaIaysia's prediction system did not work well.

d. The amount of costs recoverable under international agreements ratified by the Straits States is insufficient to compensate for such major spills[33] and the coastal countries must ratify the 1992 Fund Convention to qualify for sufficient compensation.

e. It has proven difficult to harmonize the standards and regulations for the Malacca Straits due to different legal systems, different stages of economic development and different priorities among the Straits States.

f. It apparently takes a major disaster like the *Evoikos* incident to spur the Straits States to political cooperation and agreement vis-à-vis the maritime powers.

g. Risk assessment regarding oil in the water column and sediment of the Malacca Straits will be difficult due to inadequate data.

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[33] *To obtain greater compensation, the coastal countries would have to prove that the shipowners and managers were guilty of gross negligence such as providing inadequate charts (Hand, 1997).*

h. Although there is considerable funding for environmental studies in Southeast Asia, much of it goes to redundant data collection and synthesis. Stronger efforts should be made by funding agencies to avoid funding redundant projects.

Safety measures being considered include the following:

a. Arrest and trial of masters considered negligent;

b. Imposition of penalties on ships which ignore warnings from the port traffic controller.

c. Enforcement of the STCW and ISM Code by using port State authority[34].

d. Upgrading of the vessel traffic information system (radar tracking system) by adding two or three sites in Singapore to the nine already functioning, at a cost of S$2 to 3 million each, and a RM100 million-system awaiting IMO approval.

e. Mandatory identification of vessels entering the Malacca Straits to traffic centers in Singapore and Malaysia (STRAITREP)[35].

f. Requirement of transponders on vessels using the Malacca and Singapore Straits.

g. Upgrading Singapore's present port operations command center and building a second command center at Pasir Panjang.

h. Installation of four additional circuit televisions with a range of 5 km to provide a visual image of incoming vessels.

i. Mandatory pilotage through the Straits for tankers over a certain dead-weight tonne.

ESTABLISHMENT OF A FUND

One proposal being discussed is the establishment of a fund for the management of the Malacca Straits. The fund would solicit voluntary contributions from the maritime powers and international organizations and would be managed by the Straits State to enhance safety of navigation. Contributors to this fund should be all those who benefit from the oil cycle, including producing countries and companies, refiners, tanker owners and consuming countries and companies.

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[34] *Country reports on their implementation of an enhanced STCW are due in August 1988, and the ISM Code will come into force in July 1998. Vessels without ISM certification may be detained.*

[35] *In July 1997, Singapore received the first level of approval to implement this system from IMO. In December 1998, mandatory reporting came into effect.*

One approach to establishing this fund would be to persuade users to fund specific projects related to navigational safety and pollution prevention measures (Hamzah, 1995). The precedent is the Japan-supported Malacca Straits Council which funds hydrographic surveys, stockpiling of equipment for combating pollution and the installation and maintenance of navigational aids. Potential contributors might be attracted because the contributions are voluntary, they will be able to generate political good will and future costs may be defrayed.

Possible projects to be funded include the following.

a. Environment and pollution:

1) water quality monitoring;

2) effective oil pollution preparedness and strategies for the Straits;

3) assets building and deployment;

4) capacity-building, inclusive of training and technology transfer;

5) oil spill trajectory modeling;

6) finger printing of oil and sludge and transfer of the capacity to identify sources of pollutants;

7) reception facilities for fishing vessels, oil and garbage;

8) marine pollution risk assessment in the Straits;

9) research and production of maps of protected areas in the Straits (e.g., marine parks) and maps of resources (e.g., fishing grounds) in the Straits vulnerable to oil spills;

10) development of a database on physical, biological and economic parameters of the Straits; and

11) development of a regional marine pollution surveillance and information management system.

b. Navigational safety

1) navigational aids;

2) updating of charts and hydrographic surveys;

3) study of currents and tides;

4) surveillance;

5) search and rescue (SAR) including the global maritime distress and safety system;

6) Vessel traffic management schemes-including radar and command and control equipment;

7) wreck removal;

8) a Straits of Malacca/Singapore Navigational Information System; and

9) a study of alternative routes, including the Isthmus and Kra land bridge proposal

Another possibility is to propose and promote an international convention on an International Straits Fund. This would require a concerted diplomatic initiative to mobilize support from all Straits States, e.g., Turkey, Italy and the Baltic States, for an international convention on straits funding. There is already a proposal before IMO to examine funding mechanisms in the Straits as a work programme. The IMO strategy for extra budgetary activities relating to environmentally sustainable development for international straits is as follows (MEPC 37/10)[36]:

a. Financing of capacity-building for coastal States bordering a strait used for international navigation.

1) IMO should consider potential mechanisms by which user States and littoral States used for international navigation could facilitate the development of appropriate financial mechanisms consistent with Article 43 of the 1982 UNCLOS to provide for the establishment and maintenance of necessary navigational aids and other safety aids to navigation as well as the prevention, reduction and control of pollution from ships.

[36] *Annex 2 of MEPC 37/10.*

2) Such financial mechanisms shall have due regard to the financial burden on coastal States created by the establishment and maintenance of such navigational aids and pollution prevention, reduction and control activities.

3) Such financial mechanism should be designed to achieve an equitable sharing of this "burden".

A third possibility is to introduce maritime dues. At the moment only light dues and port dues are collected. Clearly the present arrangement has not kept up with changing technology. Besides restructuring the Light Dues Board, maritime dues could be introduced to raise revenue from transiting vessels in the Strait of Malacca/Singapore to defray the cost of providing the services. The proposed maritime dues should be introduced only after consultation with the relevant parties, including IMO. Collecting dues from ships which do not call at Straits ports will be difficult. However with the assistance of the IMO and a systematic port State control mechanism, revenue collection may be possible. Nevertheless, this proposal should be studied to ensure that the introduction of such a policy would not undermine the competitiveness of Straits ports.

RISK ASSESSMENT (Calow and Forbes, 1997)

Need for Definition of Thresholds

An important aspect of prospective risk assessment is the identification of, and agreement on appropriate and relevant standards. These standards need to be coordinated so that in carrying out risk assessments and possible financial assessments or compensation, all players are using the same standards as a basis, and that this is done transparently so that revisions in the light of developing insights are facilitated. Needed is the development of a register of agreed standards for the Straits that is revised and updated in a coordinated way on a regular basis.

Risk assessment models must be based on considerable understanding of the hydrodynamics of the Straits as a whole as well as particular parts. For example, contamination and pollution from agriculture is a serious concern, and predicting environmental concentrations from this source will require the development of understanding and models concerning agricultural practice, rainfall, soil properties, groundwater and river flows and a host of other features.

The largest uncertainties in human health risk assessment are exposures. The bases of exposure assessment are diet and levels of contamination in particular foods. The former

requires the collection, collation and ready availability of information on average diets for different groups in different parts of the Straits. The latter requires a more extensive survey

Box 5. Identifying Possible Causes of Pollution in the Straits and Prioritizing Them.

1. Search international lists of hazardous substances.
2. Identify contenders for a Strait priority list by considering if any substance 1 is likely to arise from industrial activities in and around the Straits. Most will be rejected as low or zero priority.
3. Are those from 2 recorded within the Straits?
   - If **yes:** proceed to initial risk assessment
   - If **no:** is this because there have been no attempts to monitor?
     - If **no:** discard as low or zero priority.
     - If **yes:** is the substance likely to be persistent?
       - If **not detected:discard as low or zero priority.**
       - If **detected: proceed to initial risk assessment.**
4. From initial risk assessments decide on need for further action.

Source: Calow and Forbes (1997).

of dietary contamination, taking into account not only the average concentrations but also the likelihood of high doses in particular units of food leading to acute poisoning. Specific derivatives and breakdown products of oils will be important as will pesticides other than organochlorines (Box 5).

Major Areas for Risk Assessment

a. The sources of metals need to be identified and their relative contributions to general and local conditions need to be assessed. For example, industrial outputs along the Klang River deserve attention, and the Port of Singapore is a particular concern.

b. The sources of total suspended solids loadings are associated with mangrove removal and land-based sources such as (in order of importance) forestry, industrial activities, pig farming, domestic outputs and aquaculture.

c. A major source of oils and hydrocarbons would appear to be refining and this is likely to be of increasing significance as the industry expands. However contamination from municipal wastes and urban runoff can be appreciable, but there are no data on inputs from these sources.

Possible Risk Management Actions

a. Attention should be given to the ecological effects of the loss of mangroves, peat swamps and seagrass beds and an agreed and coordinated approach to clearance would be helpful.

b. Attention should also be given to declining fisheries. Needed is an agreed and coordinated approach to the rational implementation of controls on fishing intensity by using appropriate models to set levels and possibly quotas.

c. For ecological impact, risk quotients (RQs) greater than 1,000 would invite immediate action e.g., copper contamination in the Port of Singapore; oils and hydrocarbons in the Siak Estuary, Riau, Rangsang Island and Port Klang; total suspended solids at Pantai Sungal Lurus in Johor and TBT at Port Klang.

d. Food contamination from metals and pesticides deserves serious attention. Monitoring for likely contamination should be more extensive and restrictions considered for particular sites of food collection. Similar immediate measures may need to be taken to guard against sewage pollution from Malaysia and Indonesia.

e. Management actions should be more proactive by developing response strategies that formally incorporate information on, e.g., the type and volume of cargo, age of the vessel, proximity of critical habitats, currents and weather.

f. Appropriate and relevant valuations need to be developed, especially for human lives and ecological benefits and these need to be internalized into both micro- and macroeconomics models.

g. A recurrent theme is the need for coordination and agreement between all major players. The development of a suitable forum whereby this might be achieved, therefore, deserves careful consideration.

A Malacca Straits Management Authority

While Malaysia continues to be concerned about navigational safety and pollution in the Straits, Indonesia remains concerned with the security aspects of its archipelagic claim, and Singapore with the big power balance and noninterference with transit passage. Geography and stage of development also influence their respective positions. Clearly, the disparate perspectives of the Straits States militate against joint action for the sole purpose of environmental protection. Other sectoral uses of the Straits, however, also require management, including fishing, hydrocarbon exploration/exploitation, security, and transport (Valencia and Abu Bakar Jaafar, 1985b).

Perhaps a package arrangement, involving intersectoral trade-offs between the three States would provide an opportunity for enhanced order in the multi-national, multi-purpose use of this constricted and crowded waterway. A first step might be the formation of a tripartite, multiministerial level task force to review the conflicts in and between all use sectors in the Straits and to make recommendations to the three governments for further action.

Eventually, the three States might form an organization to manage the activities and uses of the Straits (a Malacca and Singapore Straits Management). The organization might take various forms: existing organizations, a regional organ, a joint commission or a joint authority. Or this range of organizational types could be considered as an evolutionary sequence.

Existing organizations which might serve as a core for building a broad-based management regime including the Council on Safety of Navigation and Control of Marine Pollution in the Straits of Malacca/Singapore, formed in 1971, the Tripartite Committee, or the Straits of Malacca Revolving Fund. The Tripartite Committee has been used successfully in the past by the three littoral States to negotiate with Japan on Straits safety and to provide technical support for these negotiations. These organizations already exist and focus specifically on the Straits. Additionally, the organization encompasses only the three Straits States. However, they deal solely with tanker shipping and were initially formed with a political objective in mind, not specifically to manage all activities in the Straits. Their use would require the establishment of a permanent office to collect funds, arrange for their replenishment after disbursement, and to seek new donors.

A regional organ could be structured similar to the United Nations, i.e., it could have a governing council of policy-makers and a secretariat for technical support. The secretariat might be divided sectorally into shipping, fisheries, non-living resources, pollution/ environment and security. Management of the environment of the Straits could be the common theme. The organization would centralize policy and provide some stability and predictability to management of use of the Straits. It also could have links with other international organizations. Its recommendations, however, similar to those of the United Nations, would not be binding on its members. Individual governments would approve policies affecting them. Additionally, there would also be issues of budget, cost and its allocation.

A joint commission could be given a legal mandate by the three littoral States to research and recommend options for action. The commission would be more independent than a regional organ, having its own arbitration machinery to settle differences. The commission could include representatives of the general citizenry and industry as well as government. Technical support would be ad hoc. The individual governments could set the agenda for the body. However, governments would probably be reluctant to surrender their control over the process and pace of policy recommendations affecting their interests.

The ideal option would be a joint authority modeled after the existing Thai-Malaysia Joint Development Authority (Datuk Harun Affirin, 1981). It would be a ministerial level, intergovernmental, policy-making assembly, overseeing an executive branch with five organs: environment, shipping, fisheries, non-living resources and security. The decisions or findings of the assembly would be binding upon the member governments. Indeed, formation of such a Ministerial Council was once discussed at Tripartite meetings, but did not materialize (M. Thilagadurai, pers. comm., 1984).

How would the joint authority work in practice? For example, development of hydrocarbon resources in the Straits could interfere with other activities such as fisheries and shipping. Such development might eventually either be constrained by protests of neighbors, or engender use and user conflict, thus reducing the total benefits of the Straits available to all three States. Therefore, the country with jurisdiction over the hydrocarbon resources would allow the authority to manage their development while ensuring conflict avoidance. Of course, for this system to work, governments must yield some management control over activities in the Straits. Also, the joint authority, without checks and balances, could become very powerful. On the other hand, because the authority would combine the political power of the three States, it would be a formidable negotiator with extraregional users of the Straits.

Certainly the establishment of such an authority would require enormous political will and advance subsidies. The need would have to be obvious and urgent. Because it is not so perceived, and political and economic priorities of the Straits States are disparate and focused on domestic issues, further concrete steps toward joint management may await a more compelling and cooperative climate.

The most likely scenario is for international cooperation in management of the Straits to proceed ad hoc—issue by issue—as they arise and sufficient common concern is generated. Eventually this plethora of issues and ad hoc responses could form the framework upon which can be constructed a broader, multisectoral management institution.

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