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**Marine Pollution And Coastal Resources Sensivity Index**

**By**

**Nasiman Sapari**

marine pollution  
environment

MARINE POLLUTION AND COASTAL RESOURCES  
SENSITIVITY INDEX.

by

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Introduction

Marine and coastal ecosystems are traditionally considered as not sensitive environments. In the past and even today many types of wastes end up in the sea. However, the rapid growth of human population together with increasing industrial and commercial activities are threatening these ecosystems. Cases of marine pollution have been reported from many part of the world. A classical example of serious marine pollution which leads to adverse health effects is the pollution incident in the Minamata bay in Japan from a chemical factory using mercuric sulphate in acetaldehyde production. The health effects from the mercury toxicity which later was known as Minamata disease caused 115 deaths in 1975 and many more were left paralysed for life.

Within the past decade marine awareness among the general public and policy makers has increased. More and more people realized the importance of marine and coastal zone resources for food protein and recreational places that contribute to human health. Also, many countries realized that the ocean floor is a

potential reserve for petroleum and minerals. This awareness is reflected by the 200 nautical mile (nm) jurisdiction over marine resource by countries having sea coasts. Malaysia claimed her "exclusive economic zone" in 1975. As a result of this claim, PETRONAS, a state-owned petroleum company, was formed to exploit petroleum and natural gas resources within this 200 nm zone.

## Conflicts

Conflicts of interest in the coastal zone is inevitable. These conflicts are the result of:

- competition for space
- competition of uses of the same resource, and
- the need for exploitation versus preservation

For example, rapid development of marine transport and petroleum extraction and processing activities together with increasing agricultural, industrial and human waste discharges are producing serious conflicts with the traditional functions of marine and coastal zone areas as a source for food protein and recreational places.

The coastal zones that are very sensitive to marine pollution include: mangrove forests, coral reefs and river estuaries. Mangrove forests are very rich environments which supports large populations of flora and fauna. Over 50 species of flora and fauna were identified in the mangrove ecosystem of

the East Coast of Peninsular Malaysia (Ridwan and De Silva, 1983). The ecosystem was also recognised as an important spawning ground for various types of fish and shrimps. Other than the fish, the marine environment is also the habitat for several endangered wildlifes (Table 1).

Wildlife	Ecosystem
Sea turtle	sea grasses and reefs for feeding and sandy beaches for nesting
Crocodile	esturine swamp of big rivers for feeding and nesting
Dugong	sea grass field for feeding
Sea bird	undisturbed islands and reefs for breeding and feeding
Whales	deep water
Dolphin	deep water

Table 1. Endangered Wildlife in Marine and Coastal Environment, Malaysia.

Some efforts have been directed towards preserving the vulnerable coastal zone areas by declaring some stretches of the mangrove forest and coral reefs as marine and coastal parks. However these declaration will not guarantee that the area will not be affected by marine pollution especially oil pollution.



## Sources of Marine Pollution

Pollutants may enter the marine environment from both land-based and marine-based sources. In this region, the land-based pollutants generally come from domestic sewage, industrial discharges such as effluents from oil palm mills and rubber factories. The marine-based sources are from marine activities such as offshore drilling, dredging, sea mining and marine transportation.

The various activity that can cause marine pollution or conflicts with the coastal zone ecosystems include :

- Transport of petroleum through the Straits of Malacca,
- Petroleum exploration in North Sumatra and South West of Thailand.
- Coastal depots and refineries in Dumai, Port Dickson and Singapore
- Offshore mining and exploration in Phuket northwards, Malacca and Penang
- Terrestrial tin mining at various locations in the South of Thailand and the West Coast of Peninsular Malaysia
- Logging activities in Sumatra and Malaysia
- Urbanization of Singapore and Malaysia
- Aquaculture in the northern part of Sumatra and West coast of Peninsular Malaysia
- Mangrove harvesting in various places in Malaysia, Indonesia and Thailand

- Tourism in Phuket, Penang and Pangkor,
- etc.

Oil tankers form one of the major threats to the marine environment. The tankers can cause oil pollution through routine cleaning and operational discharges such as transfer operations at wells, terminals, storage tanks and refineries. Tankers also cause oil pollution through accidental spills and collision of tankers.

#### Sensitivity Index of the Coastal Zones

In the event of oil spills, it is necessary to prevent the oil from entering sensitive areas such river estuaries and mangrove forests. For this purpose, the coastline can be classified into shoreline types of different sensitivity. Gundlach and Hayer (1978) suggested a classification of shorelines into units of Environmental Sensitivity Index (ESI) ranked from 1 to 10. The ranking of the shorelines is based on geomorphic, social and biological criteria. However in practice, geomorphic criteria represent the most dominant criteria. Ideally, the main consideration should be given to the nature of interactions and persistence of the pollutant on the specific shoreline type. Shoreline potentially having the highest interactions is given ESI number 10 and the shoreline with least interactions is given ESI number 1. Consideration is also given to shoreline of socio-economic importance such as fishing areas, fishing ports, boat anchorages, recreational beaches, etc. The

ranking of shoreline into various sensitivity index is shown in Table 2.

Sensitivity Index	Description of shoreline
ESI 1	Exposed rocky headlands
ESI 2	Exposed fine-grained beaches
ESI 3	Exposed medium to coarse-grained sand beaches
ESI 4	Exposed mixed sand and gravel beaches
ESI 5	Exposed gravel beaches
ESI 6	Exposed tidal flats
ESI 7	Sheltered rocky shores
ESI 8	Sheltered tidal flats and coral reefs
ESI 9	Exposed mangrove
ESI 10	Sheltered mangrove

Table 2. Sensitivity Index of Shorelines.

By using the ESI units, it is possible to identify and map out the extent of the areas sensitive to oil pollution. The mapping works generally involve sampling of flora and fauna for species identification, and sampling of beach sand for textural classification. The final map also includes up-to-date road networks and approach roads to the sensitive areas.

The ESI map forms very useful information for oil spill response teams so that they can plan appropriate shoreline protection and clean up strategies in the event of an oil spill.



## References

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