

**Regional Seminar on Coastal and Offshore  
Engineering Coastal Zone Management – A  
Necessity in Malaysia**

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# Regional Seminar on Coastal and Offshore Engineering

## Coastal Zone Management - A Necessity in Malaysia

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### Abstract

The coastal zone of Malaysia is undergoing rapid development. Much of this development is carried out without consideration of the dynamic characteristics of the coastal areas. The process of erosion and accretion are constantly going on and, in many cases, taking a toll on the development. Development also results in increase demand and conflicts in the use of the natural coastal resources. Thus, a management framework to control development of the coastal zone must be formulated. This paper looks into how this can be achieved in Malaysia.

### 1. Introduction

The coastal zone is perhaps the richest zone of development in terms of natural resources. However, it is also the zone that is the first to be developed. Most civilizations started along the coasts and river deltas, using the waterways as a means of communication and the fisheries as a food source. The flat, fertile nature of the coastal plains make the zone easy for agricultural development, and the building of structures. As countries began to industrialize, the coastal zone come under greater development pressure. The estuaries were seen as potential ports and the seas as convenient waste dumps. Thus, since the early civilizations, man has been exploiting the coastal zone to sustain development.

Lately, there is a growing realization that the different needs of development can be conflicting. Dumping of industrial wastes in the seas will endanger the fishing industry, and building of structures along the coasts can cause erosion of valuable land. The development of the coastal zone; therefore, needs to be carefully planned to resolve these conflicts and to ensure that the future development of the nation will not be jeopardized.

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Many experts concerned with the need to manage the development in the coastal zone are now recommending that Malaysia should start practicing coastal zone management. In fact, in Johor there has been a pilot study along this line. Elsewhere around the world, there are many examples that can be studied. Having a coastline of over 4,800 km and with much of the development situated in the coastal plains, it is time that Malaysia should look into implementing some form of integrated coastal zone management planning.

## 2. Coastal Zone Management

Managing the coastal zone is, in effect, managing the development within the coastal zone. The management objectives should be three fold.

1. To ensure that development will be beneficial to those depending on the coastal zone and reduce any conflicts that may arise from the various users of the zone.
2. To ensure that development will not have any negative impact on the complex natural processes within the zone or vice versa.
3. To manage the sustainable exploitation of the natural resources within the zone.

## 3. The Issues

As the population grows and demand for the development of the coastal zone increases, proper planning becomes necessary. Without proper planning environmental degradation will set in. Loss of natural resources which are sustaining the development will retard the development. The changing coastline can result in heavy loss of investment. Below are just some of the issues that need to be addressed in the management of the coastal zone.

### 3.1 Cockle Culturing

Cockle culturing is done by gathering spats and sowing them in natural mudflats, thinning them after two or three months. The cockles are then harvested nine to twelve months later. It is a sustainable method of resource exploitation and ecologically sound. However, due to the need for a suitable natural environment, conflicts with other development, within the coastal zone can arise. World Wide Fund For Nature (Malaysia), in doing the Conservation Strategy for Selangor, expressed concern for the beds at Kuala Selangor (WWF Malaysia 1987).

The threats to these beds are many. Perhaps the

biggest threat is from pollution. Pollution can be divided into two classes: Living and non-living pollutants.

a) Living Pollutants

Cockles can ingest numerous bacteria and viruses without coming to any harm themselves. Among these are harmful bacteria and viruses that cause typhoid, cholera, and hepatitis A. Overcooking can kill these bacteria and viruses but will make the cockles chewy and no longer tasty. Sewerage is the main source of these dangerous bacteria and viruses.

At the mouth of the Selangor River is the town of Kuala Selangor and the fishing village of Pasir Penambang. A new township is also being created beside the old town of Kuala Selangor. Sewerage from these population centers will be a threat to the cockle industry.

b) Non-living Pollutants

Heavy metals, and radio-nuclides can concentrate in the cockles. So far these problems do not occur in Kuala Selangor. However, the industrial estates planned at Batang Berjuntai can be a threat to the cockle beds if the proposed industries are of the type that discharge these pollutants into the Selangor River.

Pesticides are widely used in the agricultural area around Kuala Selangor. These pesticides can find their way via the drains into Selangor River and thus accumulate in the cockles.

Reduction in the flow of the Selangor River can cause changes in salinity and sediment load. Cockles are found on mudflats bordering swamp forests, close to the rivers. They are found where salinity lies between 26 and 31 ppt, although they are resistant to large, short term variations. Reduction of fresh water contribution from the Selangor River will increase the salinity of the water at the river mouth and can affect the cockle beds. Reduction of sediment load can result in erosion of the mudflats and the mangrove fringes. Thus the proposed dam at Selangor River is a cause for concern.

### 3.2 The Oil Industry and the Coastal Community

The oil industry, though it brings in a lot of revenue and creates many jobs, can give rise to many conflicts with other uses of the resources in the coastal zone.

#### a) Oil spills

Oil spills that can result from accidents during operation can be very damaging to the other natural resources within the coastal zone. These spills can be caused by so many factors, ranging from typhoons and tsunamis damaging oil rigs, to shipping accidents and pipeline leakages.

Oil emanating from oil spills can have direct lethal and sub-lethal effects on the eggs, juveniles and adults of many fish species. Fish and fishing gear can be tainted by oil, resulting in economic loss to the fishermen. Ecosystems such as estuaries, mangroves, and coral reefs, can be damaged and may take a long time to recover.

The tourism industry can also be threatened by oil spills. Oil spills on beaches are difficult to clean up and will make the beaches undesirable for a long time.

Beaches and mudflats are important feeding grounds for many forms of wildlife, especially migratory birds. Oil on beaches can be lethal to these animals. Oil covers the fur and the feathers of these animals which then becomes useless for protection from cold or for flight. It also damage the feeding grounds of these animals.

#### b) Conflict for Space and Services

The size of the operation in the oil industry means a lot of space is needed. The additional manpower that the industry brings in needs to be housed and provided with services. The refineries, the port facilities, and all the other auxiliary services, also need space. This means that land needs to be provided. In many cases, in order not to take land that has already been developed for other purposes, natural habitats are used. This means a direct loss of natural resources in the area.

### 3.3 Tourism and the Beach

Almost everybody likes to go to the beach. During holidays, many flock to the beaches for picnics, swimming, or other water-based recreation. Beaches have been the traditional holiday vacation spots. Fresh air, palms swaying, clear blue water, and clean white sand have been the image that is in the tourist mind when they come to tropical beaches. However, sometimes the image is far from reality.

There was a tendency, at one time in Malaysia to build international standard hotels, with plenty of rooms to cater for package tourists. These hotels must be right on the beach, so that tourists can come out of their rooms straight on to the beach. This makes the beach frontage inaccessible to the local community. Lack of setback guidelines for the hotel facilities and structures means that in time, as the shoreline changes, the structures become vulnerable to erosion. The aesthetic value of the beach is also reduced by the imposing bulk of the hotels. But perhaps the greatest impact of all is pollution. Liquid effluents are discharged through pipes, directly on to the beach, due to the lack of adequate sewerage systems.

With the increase in independent travelers, and new taste among the tourists, chalets are being built along the beaches, especially in the newly developed areas. Operated by small-scale operators, many of these chalets are built without proper planning. In one case, the chalets were built on a sand spit and are now being threatened by erosion. Dunes are damaged, causing the loss of the natural sand reservoir. Pollution is also a problem, although not as great as that from the large hotels along the beach.

### 3.5 Coastal Erosion

Waves and tides are the two main factors that drive the natural physical processes along the coasts. These processes cause erosion and accretion thus shaping the coastline. Any changes to the coastal processes can seriously affect the coastline.

Building of groynes, breakwaters, jetties etc. can affect the coastal processes. While such structures may be desirable to the developer constructing them, the effect of such structures can be detrimental on the land along the coastline. There are many cases where such structures have caused erosion of land and damage

to property.

Any work that reduces the sediment contribution from the land can also cause coastal erosion. Works such as construction of dams, deviation of rivers and extraction of sand from the rivers can be damaging to the coast. Such work should also be seriously regulated.

### 3.6 Siltation of Rivers and Drainage Outlets

Siltation of estuaries and drainage outlets is another problem that can occur along the coast. This siltation can be as the result of development upstream of the estuaries and the drains. Another factor can be the interference of coastal processes that normally carry the sediments from the estuaries and drainage outlets out into the sea.

Siltation of the estuaries can cause a lot of problems to the coastal communities. Fishing boats that normally enter the estuaries and outlets to land their catch will have difficulties due to the siltation. Siltation can also reduce the discharge from the estuaries and the outlets causing flooding upstream.

### 3.7 Damage of habitats

Damage of habitats can have many causes. Excessive siltation, reduction in water quality and changes in salinity, are some of the causes of habitat damage. This can affect fish, birds and other wildlife that depend on the coast. Such damage can be detrimental to the economy, especially to the fishing industry.

Development can cause this damage. Clearing of land can cause siltation. Discharge of pollution into the rivers and the seas can reduce water quality. Opening of lagoons and extraction of fresh water from rivers can change salinity.

The above issues cannot be considered to represent all the issues that arise due to conflicts in the development of the coastal zone. However, they serve as examples to show the importance of proper management of the coastal zone.

## 4. Definition of the Coastal Zone

The loose definition of a coastal zone is a general land area that has some biological or physical association with the coastline. However, for determining a boundary that can be accepted by the various bodies that play a role in the management of the coastal zone, this may not be a

workable definition. One way of narrowing down the definition is to identify the processes and give relative importance to them. Below are different definitions adopted by some countries in defining the coastal zone boundary.

#### 4.1 Sri Lanka

Sri Lanka defines the coastal zone as the area lying within the 300 m boundary landwards of the Mean High Water line and a limit of 2 km seawards of the Mean Low Water line (Amarasinghe et al '91).

#### 4.2 Philippines

The landward boundaries are the inner reaches of marine dependent ecosystems or 1 km, whichever is the greater, unless there is a significant source of an influence on the coastal system further inland. Seaward boundaries are determined by the outer reaches of fishery resource systems which are associated with, or influenced by, the coast; and/or by areas beyond which contain human or natural influences caused by ocean currents, functional jurisdictions and/or arbitrary limits for management areas which affect the nearer shore coastal waters (White '91).

#### 4.3 Alaska, U.S.A.

The Alaskan Government defines three zones that are important for consideration in the management of the coastal zone (Seaman '91).

##### 4.3.1 Zone of Direct Interaction

"The portion of the coastal area where physical and biological processes are a function of direct contact between land and sea."

##### 4.3.2 Zone of Direct Influence

"The portion of the coastal zone landward of the zone of interaction which is closely affected and influenced by the proximity between land and sea."

##### 4.3.3 Zone of Indirect Influence

"This zone extends landward to the limit of influence of land/sea biological and physical processes."

The Alaskan Government then decided to adopt the biophysical boundaries of direct interaction and direct influence as the coastal zone boundaries.



In Malaysia, we are still in the process of defining the coastal zone. Even though it is quite clear that the biophysical processes need to be taken into account, determining this will require a nation-wide study. As an interim measure, the landward boundary of the zone is taken arbitrarily as 1 km inland of the Mean High Water (MHW) line and the seaward boundary as 3 km from MHW line.

The South Johor Coastal Resources Management Plan did not attempt to determine the boundaries of the coastal zone. Instead, it concentrated in the management of the resources within the zone.

#### 5. Integrated Approach

An integrated multi-sectorial approach to coastal zone management is important to resolve the conflicts in the development of the zone. Compatibility of the different development plans must be ensured. This requires various government agencies, that are involved in the development of the coastal zone to communicate and interact. A mechanism for this must, therefore, be set in place.

An obvious starting point is the National Coastal Erosion Council. This council was set up in 1987 to formulate the erosion control strategy of Malaysia. Chaired by the Implementation and Coordination Unit of the Prime Minister's Department, the Council is made up of representatives of various federal and state agencies, that are involved in the development of the coastal zone. This council could be given the wider role of coastal zone management and, if necessary, the membership should be reviewed.

The role of the Coastal Engineering Technical Centre, in the Department of Irrigation and Drainage, is to provide technical advise to the National Coastal Erosion Council. At the moment, as the name suggests, the Centre is dealing mainly with coastal engineering problems. Manned by engineers, the expertise of the centre lies in this field. Should the role of the council be widened, the role of this centre will also have to be similarly widened.

In its 4 years of existence, the Coastal Engineering Technical Centre has amassed a lot of knowledge regarding the physical processes along the coast. It is also expanding its capability by purchasing numerical models and looking into the use of computerized geographical information systems. Further strengthening the Centre, with experts from other fields such as biologists, environmentalists and socio-economists, will ensure the capability of the Centre to play an effective role in advising on coastal zone management.

The South Johor Coastal Resources Management Plan recommends that a Coastal Resources Council be set up within the State Government to manage the coastal resources according to the

plan (Ch'ng '91). In implementing this plan, the State Economic Planning Unit plays the lead role. This is a good arrangement for the State Governments. If coastal zone management is to be successfully implemented, the State Governments must be committed and play an active role in its implementation.

#### 6. Public Participation

Awareness must be inculcated in the general public on the importance of proper management of the coastal zone. In this way, the public can be encouraged to participate in looking after the coastal environment. As they are the users of the resources in the coastal zone, they should be shown the benefits of caring for the environment. A well developed management plan should therefore provide for public participation.

Many methods are employed in various countries to encourage public participation. In the United States of America, beach clean-up campaigns are held that attract thousands of volunteers to help clean beaches (Kauffman et al '91). Such campaigns are effective in driving home the message on problem of pollution. In Phuket, Thailand, the local community participated in a project to protect the coral reefs (Lemay et al 91). These methods are successful in showing the importance of proper management of the coastal zone and getting public support.

#### 7. Conclusions

An integrated multi-sectorial Coastal Zone Management Plan is becoming a necessity in Malaysia. With the rapid development of the coastal zone, conflicts due to various uses are arising all the time. To prevent environmental degradation and to ensure that development in the coastal zone is sustainable, a well-developed management plan for the coastal zone is important.

Various countries have set up management plans for their respective coastal zones. There are merits and demerits of the various plans, and Malaysia could do well to learn from them. Closer to home, a notable effort has been made in formulating a Coastal Resources Management Plan for South Johor. From the various management plans available, the Government can formulate a plan tailored to the needs of the country.

The mechanism set up for the control of coastal erosion in Malaysia can be the starting point for setting up a mechanism for Coastal Zone Management. The National Coastal Erosion Council should be given a wider role in managing the coastal zone and the Coastal Engineering Technical Centre be strengthened with the necessary personnel.

Public participation in coastal zone management should be encouraged. A successful management plan requires that the

public, especially those that uses the coastal resources, understand its importance.

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