

**1st Annual Seminar On Sustainability Science And Management :
Issues of The Coastal Zone**

6-8 May 2002

Kuala Terengganu

**Future Management Of Shoreline Area Through
Integrated Shoreline Management Plan**

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1.0 Introduction

The coastal areas of Malaysia which support a major portion (70%) of the population, is the center of socio-economic activities such as urbanisation, agriculture, fisheries, aquaculture, oil and gas exploitation, transportation and communication, tourism, recreation, etc. Many of the industries are also located in coastal cities to facilitate export and to tap the labour pool in these urban centers. Population expansion and industrialisation are the two main factors that have contributed to the rapid growth of coastal cities, resulting in an escalation for the demand of coastal land for development.

The Malaysian coastline, which is about 4,800 km in length, is rich in coastal resources and has an abundance of natural bio diversity. However, the rapid pace of development activities in the coastal area has resulted in a conflict in the need for immediate consumption and the need to ensure the long-term supply of these resources. This has resulted in host of problems such as increased erosion areas, siltation, loss of coastal resources and the destruction of the fragile marine habitat. If these coastal resources are to be maintained and preserved for the benefit of future generations, there is an urgent need to put in place proper planning and management tool so as to ensure sustainable development in the coastal zone.

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2.0 *Problems and Issues In The Coastal Area*

The coastal area is a unique area that has a highly productive and biologically diverse ecosystem that offers crucial nursery habitats for many marine species. The coastal features such as coral reefs, mangrove forests and beach and dune systems also serve as natural defences against storms, coastal flooding and erosion. These resources are natural endowments that need to be managed for the present and future generations.

In nature, the coastal system maintains an ecological balance that accounts for shoreline stability, beach replenishment, and nutrient generation and recycling, all of which are of great ecological and socio-economic importance. These natural systems are under increasing threat from unmanaged human activities that give rise to a host of problems such as pollution, habitat destruction, and overexploitation of resources. Concern is also growing, in particular about the destruction of natural coastal ecosystems by the demands placed upon them by population and economic growth. Some of the problems affecting our shoreline are as follows: -

2.1 Coastal Erosion

According to the National Coastal Erosion Study (NCES), about 1,390 km out of a total of 4,809 km of coastline in Malaysia is facing erosion. In some areas erosion has occurred due to natural causes, but a large number of them are due to development activities along the coastline that are not properly planned or sited. Examples are: -

- Interruption of longshore sediment transport by development works such as land reclamation, dredging of navigation channels, construction of ports, groynes, breakwaters, etc.
- Removal of coastal forest such as mangroves which is a natural wave energy dissipator

2.2 Ill-Planned Development

In some cases, the developments are sited too close to the shoreline and encroach into the shorefront where periodic erosion and siltation occurs.

Because of this poor planning, severe erosion occurred at the building site even before the construction was completed.

2.3 Land Reclamation

Land reclamation can cause erosion and siltation. Of late, a large number of land reclamation projects are being carried out or are being planned. These include massive projects along the coasts of Kedah, Selangor, Melaka and Perak. Reclamation projects can cause erosion and siltation because it interferes with the natural longshore sediment transport. They can also alter the tidal flushing pattern of the nearshore areas giving rise to impacts on the existing ecosystems as well as on water quality.

2.4 Uncontrolled Marine Sand Mining

Uncontrolled sand mining can cause severe erosion problems along the shoreline. When sand mining is carried out near the shoreline, it allows bigger waves to reach the shoreline causing erosion. Marine sand mining is usually carried out to cater for the land reclamation projects mentioned above. It has been estimated that for the Kedah Land Reclamation project alone, about 2 billion m³ of sand will be needed.

2.5 Environmental Degradation

Our coastal area has a wide variety of resources and important ecological habitats such as, mangroves, beach forest, mud flats, coral reefs, sea grass, etc. These habitats in turn support and nourish the bio diversity in our coastal waters. But these habitats are also very fragile and can be destroyed by ill planned development in the coastal area that is not sensitive enough to environmental degradation. Over the past one or two decades, the area coverage of these habitats are steadily declining due to increased human activities in the coastal areas

2.6 Coastal Resources Utilisation

The coastal area supports various economic activities, which includes human settlement, commerce, tourism, industry, ports, navigation, oil and gas, fishing, aquaculture, etc. Each of this resource utilisation has the potential to give rise to cross-sectoral and intra sectoral conflicts as well as to destroy the fragile coastal eco system.

3.0 *Global Approach To Overcome Problems In The Coastal Area*

These problems related to the coastal area not limited to Malaysia alone, but are also experienced by other developing and developed nations throughout the world. It is estimated that already two thirds of the world population occupy the coastal area, and this trend is increasing. Unless careful management and planning are instituted, severe conflicts over coastal space and resources utilisation will increase, and these will lead to the degradation of the natural resources that will in turn effect the socio economic activities in the coastal area as well as diminish or close future options for development. Recognising these threats, the 1992 United Nations Conference on Environment and Development (UNCED) in Rio De Janeiro recommended the that Integrated Coastal Zone Management (ICZM) be implemented to minimise conflicts and to provide for optimal sustainable resource use. This recommendation is clearly spelt out in Chapter 17 of the Agenda 21, i.e. “Protection Of The Oceans, All Kinds Of Seas, Including Enclosed And Semi-enclosed Seas, And Coastal Areas And The Protection, Rational Use And Development Of Their Living Resources” (*ref* : <http://www.igc.apc.org/habitat/agenda21/ch-17.html>).

Ideally, ICZM covers a very large area, which include the river basin, the shoreline, as well as the marine area up to the EEZ. Each of these areas can have their individual management plans such as river basin management plans, shoreline management plans and marine management plans. Among these areas, the shoreline that forms the interface between the land and the sea is the most dynamic region due to the physical interaction of the sea and the landmass. The Integrated Shoreline Management Plan (ISMP) that is specifically developed for the shoreline area is an important component of ICZM and it has a large bearing on the overall ICZM.

4.0 Efforts By Malaysia Towards the Implementation Of Agenda 21

Malaysia, being one of the signatories to this conference is taking various steps to implement ICZM. Some of the initiatives taken by Malaysia in this direction are as follows :-

Date	Initiative
1984-5	National Coastal Erosion Study
1987	Government of Malaysia Circular (General Administrative Circular 5/87) on coastal development
1987	Establishment of National Coastal Erosion Council and Coastal Engineering Technical Center at the DID
1986-92	South Johore Coastal Resources Management Study
1991-96	National Coastal Resources Management Policy
1997	DID Guideline 1/97 on coastal development
1997	Guideline by JPBD on coastal development
1997-2000	Pilot Project on ICZM in Sabah, Sarawak & Pulau Pinang
1999-2001	National Policy on ICZM by EPU

The Economic Planning Unit of the Prime Minister's Department has taken the initiative to formulate a national policy on ICZM as indicated above. The final draft of the policy has been circulated to all the Federal Agencies as well as the State Governments for their comments.

5.0 Role of DID in the implementation of ICZM

The Department of Irrigation and Drainage (DID), which is actively involved in the shoreline area with respect to coastal protection, river mouth improvement, etc. has now embarked on a nationwide program to carry out ISMP. This program is intended to support and complement the initiative by the Economic Planning Unit to carry out ICZM. Apart from helping the DID in its long term aim of minimising the emergence of new erosion areas, the ISMP will also assist in preserving the coastal environment and ensuring sustainable development in the coastal area.

By carrying out ISMP it will be possible to maximise the benefits to be derived from the coastal area and its resources while at the same time minimising the harmful impacts on the coastal resources and the environment. It will also help in reducing the conflicts between different users in the coastal area and the harmful effects of human activities upon each other.

6.0 *Integrated Shoreline Management Plan (ISMP)*

The ISMP program to be carried out by the DID is tailored along the principles of ICZM to address the major issues and problems facing our shoreline. It is an integrated approach that takes into account all the sectoral activities that affect the coastal area and gives due consideration to economic, social, environmental and ecological issues. The goal is to develop a management tool to harmonise all the activities in the coastal area to support a broader set of management objectives for the coastal area.

6.1 Objectives of ISMP

The ISMP program adopted by the DID has three main objectives. These are as follows: -

a) Appraisal and selection of coastal development management strategies so that the development in the coastal area can be carried out in a sustainable manner

This will consist of establishing zonation schemes along the coastline to identify areas for particular uses, activity or development. This will be formulated with due consideration to the coastal processes, coastal resources and development needs to ensure sustainable development of the coastal area.

b) Appraisal and selection of defence options for the coastline

This will serve as a guide for any future coastal erosion protection works along the shoreline. This is to ensure that the management

objectives of the coastal area is met while minimising the impacts on adjacent areas

c) *Formulation of Specific Guidelines and Policies for Development Activities / Proposals in the coastal area*

This will entail the formulation of site-specific guidelines and / or policies for development activities based on the local coastal processes and coastal resources.

6.2 Determination Of Limit Of Shoreline Area

One of the important decisions in carrying out the ISMP is to determine the limits of the shoreline area. The management area should include all the coastal resources of interest and also include all the coastal processes. The limit may vary from place to place, but as a general guide, the following landward and seaward limits have been adopted: -

- Landward limit is about 1 km from shoreline (at MHWS)
- Seaward limit is about 3 km where the coastal processes have little impact on the shoreline

6.3 Division Of The Shoreline Into Management Units

Over a length of shoreline, the physical characteristics, coastal features and land use vary tremendously, making it rather difficult to formulate meaningful guidelines or policies. In order to overcome this problem the shoreline is sub-divided into small units called management units. A Management Unit can be defined as a length of shoreline with coherent characteristics in terms of both natural coastal processes and land use. An illustration of the management unit is as shown in Fig. 1.

6.4 Participation of the Coastal Stakeholders in the development of ISMP

An important element of the ISMP is to promote the participation of the coastal stakeholders in the preparation of the ISMP. A working group called ‘Kumpulan Kerja Pengurusan Garispantai – KKPG’ comprising of all the key interest groups and all parties who have an interest in the coastal area will be formed to actively participate in the ISMP. The members of KKPG are to be encouraged to supply information on their objectives and any specific requirements, which they consider essential to achieve these objectives. The feedback from the KKPG on their needs, aspirations and expectations pertaining the coastline will play an important role in determining the management objectives of the coastal area.

Regular meetings of the KKPG will be organised so that the interests and aspirations of each party can be clearly understood and taken into consideration in the ISMP. At the same time, the KKPG members will be kept informed of all developments and will have the opportunity to contribute to the ISMP throughout its development. Areas of conflicting interests, which may affect the ISMP, should be resolved by consensus.

6.5 Development of ISMP

The ISMP can be developed in different ways. The approach adopted by DID is to carry out ISMP in the following phases, i.e.:

- a) Data collection,
- b) Analysis,
- c) Setting management objectives,
- d) Management plan preparation and
- e) Development of Decision Support System (DSS) to implement ISMP

a) Data Collection

An effective ISMP must be based upon adequate information with respect to physical, economic, social, ecological and governmental aspects of the coastal area. Some of these data and information may be

already available within the various governmental departments, regional development plans, resource inventories, NGO's, coastal user groups, etc. Apart from collating all these secondary data, it is also necessary to carry out primary data collection where the required information is limited or unavailable. The primary data collection may comprise of met ocean data (related to coastal engineering), water quality, seabed sediments, land use, marine ecology, terrestrial ecology, etc.

b) Analyses

All the data that has been collected has to be analysed in order to determine the detail characteristics of the shoreline area. The types of analysis to be carried may vary from place to place depending on issues that are important to the particular area. However some of the more general analyses to be carried out are as follows:

- ✦ Coastal Hydrodynamics
- ✦ Nearshore Wave Characteristics
- ✦ Coastal Sediment Budget
- ✦ Pollution Loading Assessment
- ✦ Coastline Classification
- ✦ Coastline Evolution
- ✦ Suspended Sediment Plume Dispersion
- ✦ Tidal Flushing and Water Quality
- ✦ Coastal Habitats
- ✦ Land Use
- ✦ Recreation and Tourism
- ✦ Socio-Economics
- ✦ Archaeological and Historical Features
- ✦ Legal and Institutional

c) Setting Management Objectives

A key element of the ISMP is the formulation of Management Objectives for the coastal area. The management objectives will be formulated based

on all the data that has been collected and analysed together with all the feedback from the various coastal stakeholders.

Due consideration will be given to conflicting issues, especially pertaining to development versus environmental conservation. The input from the KKPG will play an important role in this process. Any conflicting issues will be resolved by consensus. These management objectives should be finalised and adopted with the concurrence of the State Government and all the relevant parties.

d) Management Plan Preparation

The preparation of the management plan entails the development of policies, guidelines, strategies and zonation of the coastal area with the aim of achieving the management objectives that have been agreed upon. The baseline data and assessment carried out earlier will also be used in the plan preparation, which involves the following: -

i) *Selection of coastal defence options for each management unit*

Examples of coastal defence options are:

- Do nothing,
- Maintain the existing coastline using either hard or soft structures,
- Retreat the shoreline,
- Advance the shoreline

ii) *Selection of coastal development management strategies for each management unit*

This involves zonation of the coastal area. Examples are:

- Protected
- Development Prohibited
- Development Restricted
- Development with setback
- Resort Development (with or without setback)

- Urban Development (with or without setback), etc.

iii) Development of specific guidelines for development activities along the shoreline

Examples of some of the guidelines are:

- Setback distance
- Sand mining
- Disposal of waste, etc.

6.6 Monitoring, Evaluation and Modifications To ISMP

The ISMP is a dynamic document and it has to be periodically reviewed and updated. Periodic monitoring must be carried out to update the GIS that has been prepared. The latest data must be analysed and evaluated, and the relevant modifications must be carried out to the ISMP. The consultative process that has been established during the initial development period between the various coastal stakeholders, the State Government, various government agencies, etc., should also be continued so that any modifications to the ISMP is achieved through consensus.

7.0 *Development of a Decision Support System at the State Level*

The ISMP will serve as a core for the decision support system (DSS) to be set up at the state level. The DSS will assist the State Government and the various Government Agencies in making decisions relating to development in the coastal area. All the data related to the shoreline that have been collected during the development phase will be kept at the State level in a GIS Database format. The data will be continuously updated to include the latest developments in the coastal area. Additional hydraulic computer modelling and other relevant analysis will be carried out whenever necessary to update the management plans, and the up-to-date plans will then be made available to the State Government and other relevant agencies.

The purpose of the DSS will be to allow the State Government and other relevant State Agencies in making decisions pertaining to the coastal area with the confidence

that their decisions support the overall management objectives of the ISMP and adhere to the principles of sustainable development.

In order to make informed decisions, the relevant up to date data and information must be made available. As a start JPS has initiated the development of a GIS database within the Coastal Engineering Division (CED) for storing coastal engineering data. A number of GIS coverages had been developed by CED and work is ongoing to develop additional GIS coverages for Surface Shipboard Meteorological Observation (SSMO), Voluntary Observing Ships (VOS), Littoral Environment Observation (LEO) and tidal data. Apart from this, JPS is also developing a comprehensive GIS based Database and Information system under the ISMP that encompasses various aspects of shoreline management such as coastal habitats and ecosystems, coastal processes, coastal land use, water quality, etc. This database was developed through the collection of various types of data such as land use, cadastral information, tourism, industrial activities, fisheries, archaeological sites, marine habitat, terrestrial habitat, sand mining, quarries, etc., some of which were kept and maintained by various other agencies such as Local Authorities, Town and Country Planning Department, Fisheries Department, Agriculture Department, etc. These data will be updated regularly so that the ISMP will provide up to date information and can be used as a tool in the decision making process.

Decision making in shoreline management is a complex task as it has to take into account various factors such as those encompassed by the ISMP as well as the future development scenarios and their potential impacts. In order to ensure that the decision making process gives proper consideration to the ISMP that has been prepared, it is necessary to develop a management tool/system that encompasses the ISMP and assists in the overall decision making process. This system should be able to detect and alert the State Government of any development proposals that contradict the policies, conditions and guidelines developed under the ISMP and to establish an informed decision making process so as to ensure a systematic, scientific and sustainable management of the coastal area.

This can be best achieved by setting up a Decision Support System that capitalizes on the latest ICT and which comprises the ISMP as its core together with other relevant tools such as simulation / predictive tools (e.g. MIKE 21, LITTPACK, etc.), GIS, etc. The technical support for carrying out the simulations and the use of other predictive tools shall be provided by the CED, DID.

The DSS shall be linked to all the relevant government agencies involved in the decision making process to disseminate information as well as to solicit feedback on various aspects related to the development in the coastal area. The aim of the DSS is to assist the State Government and the various State Government Agencies / Departments in making informed decisions with respect to the development in the coastal area in order to support a broader set of management objectives that has been developed under the ISMP

8.0 *Program For The Implementation Of The ISMP*

8.1 *Current Progress*

Presently the DID is carrying out a pilot project on ISMP along the northern shoreline of the State of Pahang, i.e. from Kuala Sg. Pahang to the State Boundary between Pahang and Terengganu. This study started in March 2000 and it is expected that it will be completed by Dec. 2001. The consultant has already completed the data collection and the various analyses that are required. They are now carrying the second and third phase of the project, i.e. 'Setting the Management Objectives' for the various management units and the preparation of the draft ISMP Plans.

8.2 *Future Planning for the Implementation of the ISMP*

Based on the experience gained from the pilot project mentioned above, the DID will be carrying out the ISMP program throughout the whole country in the near future. Under the 8th Malaysia Plan the CED had initially requested

for an allocation of about RM 51.3 million to carry out ISMP throughout the country. However, the Central Agencies only approved about RM 0.9 million, under the 8th Malaysia Plan, which is just sufficient to complete the pilot project in Pahang. However, under the 'Must Have' projects, the CED has requested for an additional RM 28.8 million to carry out ISMP in the following States :-

- i) Pahang (southern coastline)
- ii) Perak
- iii) Labuan
- iv) Sarawak
- v) Pulau Pinang

The prioritisation in the selection of the shoreline is largely based on the willingness or readiness of the State Governments to carry out and implement ISMP in their respective States. Lately, the EPU has also approved an additional allocation of RM 2 million for carrying out ISMP along the coastline of Negeri Sembilan following a Cabinet decision to improve the shoreline in the Port Dickson area. Consequently, the DID is currently taking immediate steps to implement ISMP in Negeri Sembilan.

9.0 Conclusion

The coastal area is under increasing threat from unmanaged human activities that give rise to a host of problems such as pollution, habitat destruction, and overexploitation of coastal resources. In order to contain these problems and issues it is important to put in place proper planning and management mechanism/tool for the coastal area in order to ensure long-term sustainability of the coastal resources as well as to improve the quality of life in the coastal region for the benefit of future generations. This can be achieved by carrying out Integrated Shoreline Management Plan (ISMP).

References:

- 1) ***Shoreline Management Plans, A guide to coastal defence authorities***
By Ministry of Agriculture, Fisheries and Food, United Kingdom
- 2) ***Guidelines For Integrated Coastal Zone Management***
By Jan. C. Post and Carl G. Lundin, World Bank
- 3) ***The Development of a Coastal Zone Management Policy For Malaysia***
By Mohd Nizam Bin Basiron, MIMA
- 4) ***Terms of Reference For Integrated Shoreline Management Plan of the Coastline From Kuala Sungai Pahang to the State Boundary of Pahang and Terengganu***
By the Department of Irrigation and Drainage