

## CHAPTER 7 RECOMMENDATIONS & CONCLUSION

Any activities as a rule has its impact on the environment which shall be pre-empted at the initial stage of planning, in order to enable early preparations to cope with the negative impacts and to develop the positive ones within the framework.

It is not feasible to defend all the eroding coasts. It has been estimated that protecting a kilometre of coastline costs up to RM4 million. The RM30 million budgets under the 8<sup>th</sup> Malaysian Plan for anti erosion measures are grossly inadequate.

Erosion can be avoided or largely mitigated if there is a proper understanding of coastal processes and assessments made on the impacts of development. These require a long-term baseline data that allows an accurate projection of trends on coastline change. Unfortunately, such information is often lacking for many parts of the country.

### 7.1 Recommendations

Past experience and case studies on project achievements and failures are some of the important tools for better management purposes. The great success of polder land conversion in Netherlands as well as in some other countries and in Malaysia is a good example that has yet to be learned and practiced in Rungkup.

Some valuable lessons learned are managed retreat, management policies etc.

### **7.1.1 Managed Retreat**

Managed retreat is a strategy to encourage the movement of the coastline landward of its present position in a managed or controlled manner, hence the term 'managed retreat'.

In managed retreat, coastal defences are dismantled or abandoned and the sea is allowed to encroach inland to a predetermined 'set back' line. This allows both the dissipation of energy of waves and tides and long term adjustments of the coastline to environmental change, such as sea level rise. Such an approach might be suitable where the long term provision of hard defences is economically or environmentally unsustainable.

This technique is consistent with the natural cycles of accretion and erosion at the coastline, helping to liberate sand and mudflats and sandbanks, further down the coast, thus enhancing natural coastal defences.

Managed retreat is being increasingly used to allow increased coastal protection and wave attenuation. By looking at the success of natural retreat schemes (i.e. those where the sea breached defences and those breaches were not repaired as in Sg Burung, Sabak Bernam, Sg. Lurus, Johore, Netherlands, Pagham Harbour, Essex and Suffolk, England) it is possible to learn and apply the scheme to Rungkup areas.

Since Rungkup coast has low development, managed retreat is practical. Retreating in Rungkup is cost saving and deserting the coastline incurs little expenses compared to the high maintenance cost spend every year. Therefore managed retreat schemes should be reviewed for their viability as potential

management options or else expense and continue commitment to maintenance would be immense.

It is highly recommended that investigation of other economic benefits of managed retreat should be carried out on retreated sites in Rungkup where:

- a. There may be scope to develop some of the traditional industries, such as oyster growing on managed retreat sites,
- b. There may also be opportunities to offer specialist wildfowling or bird watching tours. There is an opportunity to develop community run enterprises that would be viable in the long term and could contribute to other community projects.

Planning for managed retreat is necessary for Rungkup area which is vulnerable to future sea level rise and not sufficiently valuable or productive economically to justify the expenses of maintaining large-scale protection works or further land conversion. Opportunities for replacing hard defences with natural defences such as mangroves should be pursued. Not all habitats can be recreated but mangroves may be.

## **7.1.2 Policies**

Managing coastal resources wisely means guiding the use of coastal lands and water in a way that protects resources for future generations while allowing coastal communities and economics to thrive.

The following are recommended:

### **7.1.2.1 Understanding Coastline Change**

Identifying areas subject to both long and short-term erosion and understanding the causes of erosion are important if we wish to avoid building homes, structures, and infrastructure in high hazard area. The correct interpretation of coastline change data can help coastal planners and property owners identify appropriate and inappropriate areas to place structures. The combination of long term coastline movements, an understanding of coastal processes and knowledge of the effects of hard structures, etc is essential to proper siting of coastal structures.

Learning from past mistakes, though unfortunate, can also aid coastal planners. Consider the following lessons learned about coastline change in Rungkup: -

- Construction of Temenggong dam resulted in downdrift erosion in Rungkup Peninsula, with a maximum erosion of the downdrift coastline in Sg Tiang and Sg Belukang,

- The clearing of land in Parit Dayang by Ghadaf Marble for the construction of a port has caused erosion in Bagan Pasir Laut recently,
- The erosion rate along the Rungkup Peninsula coastline has accelerated since the 1970s. The principal sediment sources for this coast have been armoured with revetment. This has significantly reduced the major source material for the coast. The apparent cause and effect nature of the revetments seem to indicate that the rate of coastline change since the construction of these revetments should take precedence over the long term rate of change in future planning and management for this area.

Sg. Tiang and Sg. Belukang have a long term average coastline change with net accretion from 1941 to 1972, suggesting a relatively stable area. However, from 1972 onwards the coastline started to erode. Unfortunately, many homes were constructed during the accretion phase. Since the trend reversed to erosion beginning in 1970s, many houses have been lost to erosion and storms.

These examples make it clear that to properly manage the coastline, analysis of both long and short term coastline changes are required to determine which is more reflective of the potential future coastline configuration.

### **7.1.2.2 Institutional Strengthening**

There is no single, coherent national policy on coastal erosion. Instead the local government response to erosion has been ad hoc, sporadic and sometimes inconsistent. I believe that implementation of national policy must now evolve to provide not only mitigation of the effects of erosion and flooding but also to embrace more holistic management of our river systems and coastlines.

Improved information flow between government departments was identified as a primary prerequisite in order to achieve the goal of sustainable coastal management. It was generally felt that this could be achieved through the establishment at country level, inter agency committees, although one agency would need to take the lead. There should be increased environmental impact to economic planning since economic planning is a key agency in most countries with its direct links to national budgets and overseas assistance projects. The establishment of environmental desks in this agency is recommended. Environmental impact assessment (EIA) process needs to be strengthened in terms of scientific thoroughness and administrative significance. Ecological risk assessment and decision support systems might help achieve this goal.

### **7.1.2.3 Awareness Building**

From the survey carried out on the respondents' perception about coastal erosion we can conclude that the majority of the respondents were not well educated. They were unaware of the benefits of preserving mangrove as a form of natural defence systems against coastal erosion in Rungkup. Therefore it

seems particularly important to provide these coastline residents with information on the causes of erosion and local erosion trends. Documents like the National Coastal Study reports are valuable summary compilations of local data. It is recommended that all coastal stakeholders be included in the management process while at certain times targeting special interest groups such as fishermen, insurance companies, etc. It is recommended that inter agency committees set up to facilitate information flow, provide the mechanisms for networking as well as education and awareness activities. All forms of media-electronic and otherwise should be utilised. Slide sets and videos are especially identified and these could also be used in the schools.

One of the major problems experienced in all coastal areas is how to make senior administrators and politicians more aware of coastal management problems. Solution must be sought using existing means such as field trips, seminars, community intermediaries, newspapers and other forms of media and development guidelines as mentioned earlier. At the local and country levels there is a need to provide certain specific types of information:

- For coastal communities about their rights and responsibilities
- Information sheets on subjects such as how to report problems, how to stay within the law, how to conserve mangroves etc.

These types of information are best supplied at the local or national levels. Small grants are needed for local NGOs who working together with the inter-agency committees, could prepare and distribute this type of information through newsletters and fact sheets.

#### **7.1.2.4 Enforcement Needs**

There is a consensus that enforcement is one of the weakest areas of coast management and that education and awareness are vital components of enforcement. Successful enforcement requires that the socio-cultural aspects of coast management are addressed at the community and national levels only in this way can local residents help 'police' their natural resources. Besides public involvement, inter-agency co-operation is required. One starting point is to co-ordinate the activities of different agencies so that they do indeed help each other. Without doubt, improved collaboration and co-operation at national and regional levels is needed in order to achieve the goal of 'sustainable coastal management'.

#### **7.1.2.5 Maintenance and Monitoring**

Maintenance is a key element in the provision of adequate defence. Post maintenance may increase risks of failure, or reduce the planned life of the defence.

Monitoring, that is the checking on progress, condition or operation is an essential element of any scheme of works. Monitoring during and after



construction of a defence can ensure more effective management and implementation (DEFRA 1993).

Maintenance and monitoring in Rungkup should be carried out before the monsoon season at the end of the year. This is to reduce the risk of flooding faced by the coastal residents.

#### **7.1.2.6 Setback Lines**

Since there is a need for future development in the coastal zone in the interest of the country's economic well being setback policies must be designed to ensure that new development is sustainable. Thus new development should not threaten the integrity of the coastal marine environment.

Local government can assist property owners in addressing risks associated with construction on eroding coastline by establishing uniform setback requirements for new construction. The setback provisions are based on the existing setback.

Due to the changing nature of the coastline, the setback line should be periodically reviewed to determine the need for modification. Reviews can be made every five to ten years, depending on the degree of instability of the coast involved.

### 7.1.2.7 Sea Level Rise

With the increase in greenhouse gases and the threat of global warming, coastal living in the coming century will become more precarious. Sea level is projected to rise and storms are likely to grow stronger. Governments may need to consider restricting or even prohibiting further coastal development in Rungkup altogether.

Sea level rise needs to be incorporated into long-term management planning. This may mean planting species with a greater capacity to cope with rising sea-level, encouraging the accumulation of sediments amongst existing mangrove stands so that they can raise the levels of their substrate at the same rate as sea level rise, and identifying, preparing and replanting areas which will become progressively inundated by the tide.

It is highly recommended the following to minimize the impact of sea level rise in Rungkup area:

#### **a. Monitoring programs**

Direct observation of change can be undertaken at national and international level and early establishment of the required range of monitoring program and integrated databases is crucial if rapid and efficient management responses are to be made should sea level induced changes occur rapidly during the next century.

Firstly, all existing tidal data should be accumulated in computer-compatible form for analysing trends and the local variability of extreme

events. Secondly, the balance between erosion and deposition at the coastline should be annually reviewed, not only for Rungkup coast but also the whole coastline of Bagan Datoh since this may influence sediment supply. A cost-effective method of monitoring annual change may be remote sensing. Annual analysis of satellite data, assuming the availability of suitable cloud-free data, will provide an essential database for assessing rates of change if net accretion and seaward expansion of the vegetation and sediment zones in front of reclamation embankments is to be replaced by the movement of these zones towards the present sea banks as the rate of sea level rise increased.

**b. Decision Making**

The alternative courses of action are firstly, flooding of recently reclaimed land or secondly, the construction of embankments around existing valuable inter-tidal areas. These pose the questions of whether inter-tidal environments are sufficiently valuable to require conservation at relatively large cost.

An earth embankment with sluices for the main creeks would provide the means for managing tidal flow, the balance between erosion and deposition, and the vegetation succession. Plans for the cost, legal, engineering and ecological requirements for a range of schemes to cover the whole coastline of Rungkup and the range of environments considered essential for conservation should be developed as soon as possible.

In addition to flood protection, flood alleviation and land drainage must be considered. Monitoring of and levels, drainage requirements, saltwater intrusion in ditches and groundwater, and fresh water run-off inland of the coast form part of the monitoring requirements. Flood alleviation costs are a significant part of the decision making process, along with population numbers and property values in any cost-benefit analysis.

**c. The Legal, Financial and Strategic Framework**

Response measures to protect life and natural environment from the impact of flooding and erosion fall into three main categories: associated emergency procedures, maintenance and monitoring of artificial defences or the maintenance and monitoring of natural defences.

There is good reason to believe that, in many instances, coastal erosion will continue long into the future especially if sea level continues to rise in response to global warming. In response to the impact of sea level rise, increased expenditure will be necessary on flood protection and the planning and zoning of activities in coastal areas, including agriculture, transportation may have to be rethought.

Sea level rise will have significant implications for all activities in low lying areas. Given the planning timescales involved, it is important that serious

and prompt consideration be given to suitable responses in relevant policy areas such as coastal protection, agriculture and land use zoning.

With enough sea level rise, it may become impossible to sustain any structure and retreat and abandonment may become necessary.

#### **7.1.2.8 Future Needs**

If relative sea level continues to rise and if global warming leads to increased severity of weather patterns and storms, coastal residents of Rungkup can anticipate more rapid erosion of coast and coastlines including locations where homes presently stand. Erosion in one place will produce accretion or a build up of sand or shells in another place. There is both an obligations to protect our coastal ecosystem and to maintain their sustainability and an obligation to assist coastal homeowners in protecting their homes in ways that are compatible with coastal processes. By minimising the number of homes sited in the “danger zone” in the future, costs to society can be reduced. The present work on Rungkup coast may provide the basis for evaluation of erosional and depositional patterns in other locations.

Co-operation among federal, state and local regulatory bodies is required to address the complex issues of coastal erosion and coastal hazards. Local government can assist these agencies in evaluating coastal hazards and can provide technical assistance to address the problems of coastal erosion.

It is highly recommended that the following advice be adhere:

**a. New Development in Floodable Areas**

The EIA seeks to guide new development away from flood risk areas. This issue will become increasingly important given expected sea level rises. New developments will need to take account of these risks, both present and future. Any proposal to provide mitigation, including the raising of land levels, should not increase risks elsewhere.

**b. The Need for New and Improved Coastal Defences**

Coastal defences need to be planned within a strategic framework which recognises the many issues and interests which affect coastal defences and coast protection may need to be improved to respond to changes such as rising sea level and development in areas at risk from flooding or erosion.

**c. Reducing Disaster Losses through Hazard Mitigation**

Hazard mitigation is the term used to describe activities that minimise either an individual's or a community's vulnerability to future disaster damages. Mitigation is often characterised as either structural (e.g. strengthening buildings or constructing protective devices) or non-structural (e.g. land use planning or incentive-based insurance rates). Land use plans are a valuable tool in that they can designate low-risk uses for areas most vulnerable to natural hazard impacts. Land use planning has long been recognised as an effective method for mitigating the impacts of

natural hazards. Since location is a key factor in determining the risks associated with natural hazards, land use plans are a valuable tool in that they can designate low risk uses for areas that are most vulnerable to natural hazards impacts.

Technology improvements such as the use of Geographic Information System in local planning allow numerous factors, including hazards, to be considered in making land use decisions.

In a broader context, however, loss reduction or hazard mitigation can more accurately be described as a long range goal or objective with many potential strategies for accomplishment.

There is now a recognisable need to improve the methods for collecting, reporting, and maintaining databases on the losses association with natural hazards. One of the primary obstacles to implementing a more complete disaster loss database is the government's fragmented approach to hazard information. Different agencies and organisation have responsibility for different types of hazards data. Often the data is anecdotal, collected for a specific case study or event, and not part of a larger, on going data collection effort. Categories of losses are generally not consistent from one agency to another, and when disaster loss totals for a single event are compared between agencies, they are rarely even close to the same figure. These inconsistencies create huge gaps in accountability and do not provide an adequate baseline for measuring progress for hazard mitigation.

### **7.1.2.9 Identification of Critical and Significant Erosion Area**

Critical erosion refers to areas where coastal erosion has threatened coastline development or infrastructure. They are existing management challenges. In most case, the coastline has been armoured to protect property and development, and there has been a noticeable environmental impact and/or a decrease in recreational use. These areas can be restored, but restoration will require substantial economic resources.

Significant erosion refers to areas where the coastal environment will soon be threatened if coastline erosion trends continue. A potential conflict between the desire to protect property and the desire to maintain the coast resource exists at these areas.

Land loss is a subset of critical erosion areas. It is essential to recognize these existing and potential erosion problem areas when planning developments as redevelopments, regulating structures, and considering prospective areas for coastal protection or coast nourishment projects. A list of preliminary critical erosion areas and significant erosion areas appears in Table 7.1. These areas were identified by an analysis of a coastal erosion rate study, reports of long time coastal residents, and site inspections.



**Table 7.1. Preliminary critical and significant erosion areas in Rungkup**

CRITICAL EROSION AREAS	SIGNIFICANT EROSION AREAS
Sg Tiang	Sg Burung
Tebuk Semani	Rungkup
Sg Belukang	Bagan Lipas
Sg Batang	Bagan Pasir Laut

## **7.2 Conclusion**

Coasts, as boundaries between land and water are characterized by the geologic nature of the land, which is unstable and often fragile, and the dynamic power of wind and sea.

Intelligent stewardship of our coastal resources requires balancing human needs and expectations with coastal realities. Ignorance and continued disregard of the geologic processes that constantly reshape our coasts are tragically intensifying the collisions between people and nature.

Coordinated multidisciplinary efforts are needed to improve our understanding of how coasts form and evolve. A clear understanding of how coastal environments have formed and what natural changes they have undergone in the recent geologic past can be critical in predicting with confidence their future.

Dealing effectively with the present coastal crisis and resolving future conflicts along our coasts will require a combination of solutions that must be

based on long term societal needs and on sound scientific and technical knowledge, rather than emotional responses to short term desires.

With the help of this detailed study, I truly hope that sustainable development can be achieved in Rungkup Peninsula thru proper planning. As the saying goes, planning today would be more effective than reacting later.