Morphological Changes in the Vicinity of Detached Breakwater at Sungai Haji Dorani, Peninsular Malaysia

(P038)

Presented by

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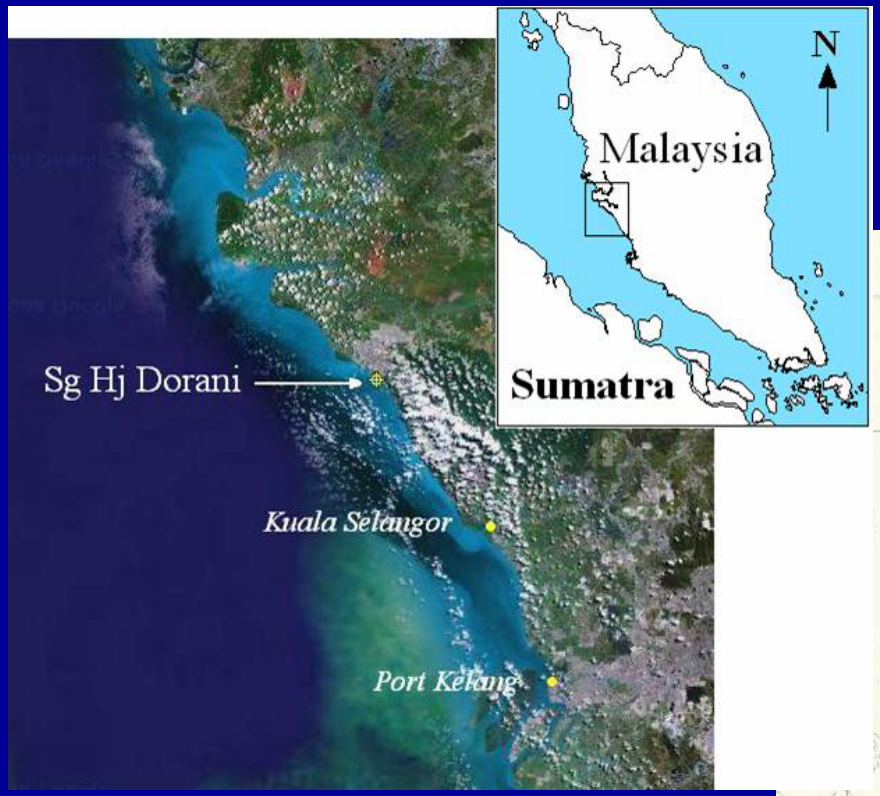
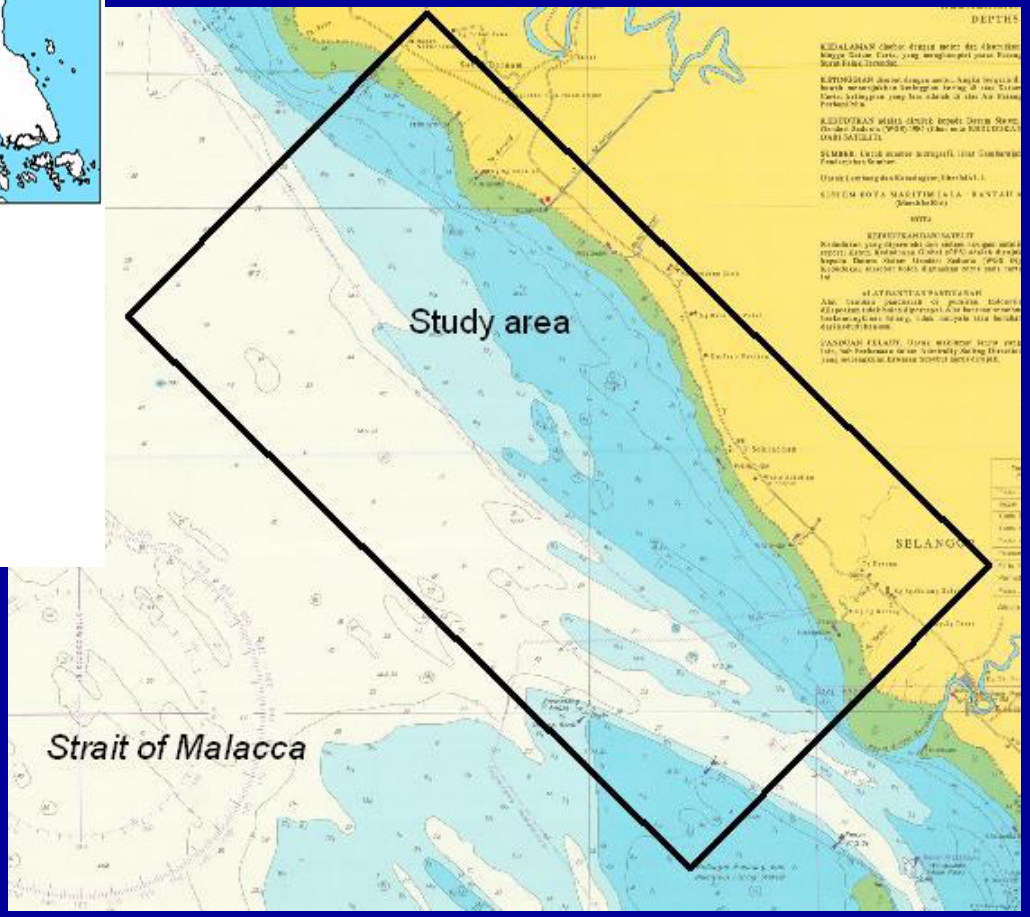
Introduction

Project site on the Sungai Haji Dorani beach





The Presentation:

1. Introduction
2. Methodology
3. Results & Discussion
4. Conclusion & Recommendation

Introduction

As development took place in Malaysian coastal areas, land clearing including the removal of mangroves along coastlines exposed coastal areas to natural hazards such as tidal inundation, storm surges, currents, and wave action resulting in severe coastline retreat.

A **sustainable coastal management** should manage and protect coastal resources (against erosion, degradation, pollution etc.) & continue promoting economic and recreational activities

Destruction of Mangroves

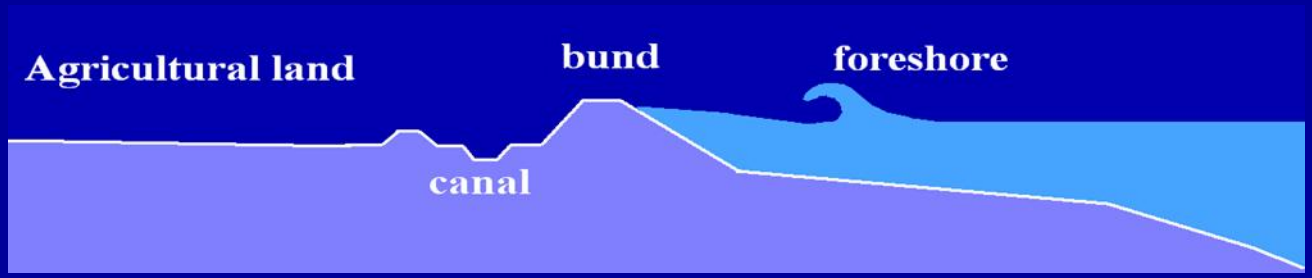
Eroded Coastline

1. Dept. of Irrigation and Drainage of Malaysia (2006) reported that 1414.5 km, 29%, of Malaysian shorelines face erosion impacts.

2. Area of mangrove forests declines at a rate of 1% per year (Gong & Ong, 1990)

Introduction

To protect the coastal areas against flooding and reclaim land for agricultural activities, *dykes* (‘coastal bunds’) and revetments have been often constructed along the eroding shorelines of Peninsular Malaysia.



Research Objectives

The main objective of the research is to examine an *"integrated approach to coastal erosion management"* using hard coastal structures that provide suitable conditions for applying rehabilitation measures to eroded coastlines

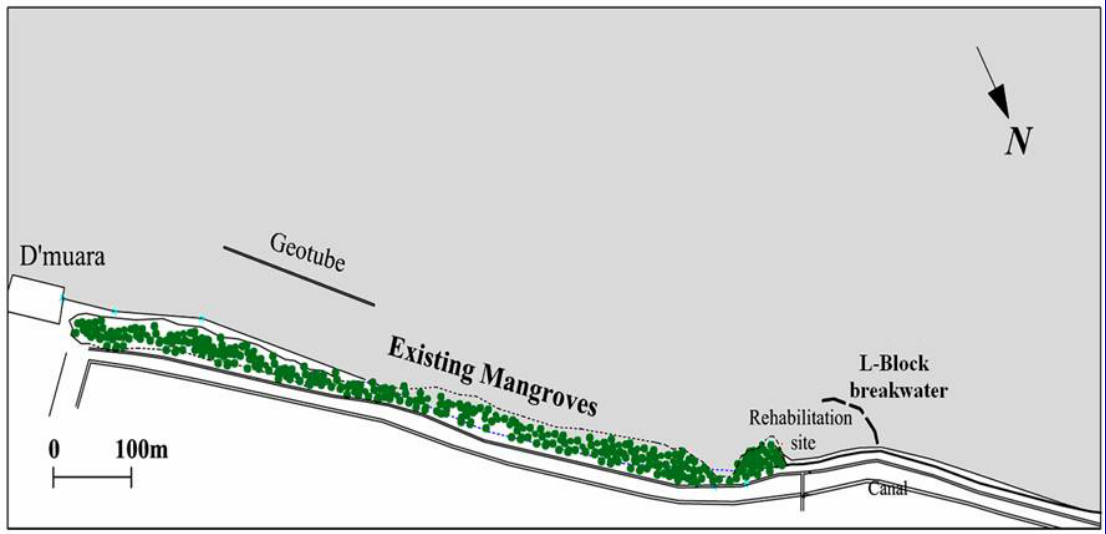
Background Information

1977: dyke construction along the shoreline.

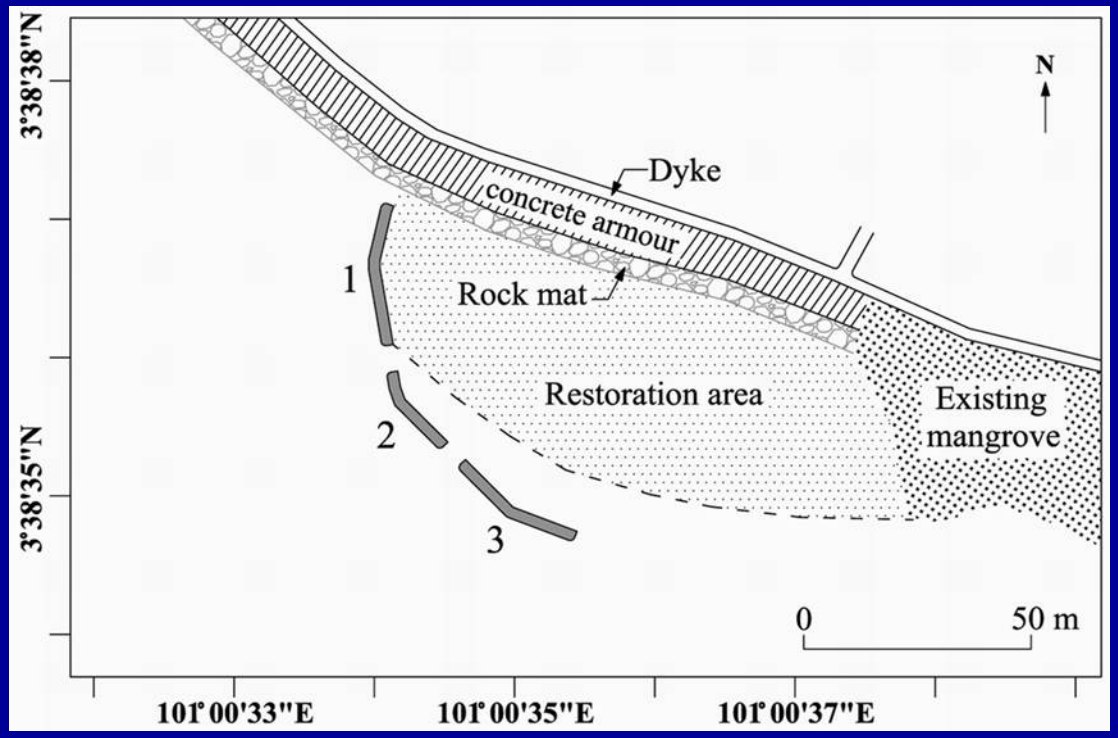
1991: maintenance; 1.5km of dyke was armoured.

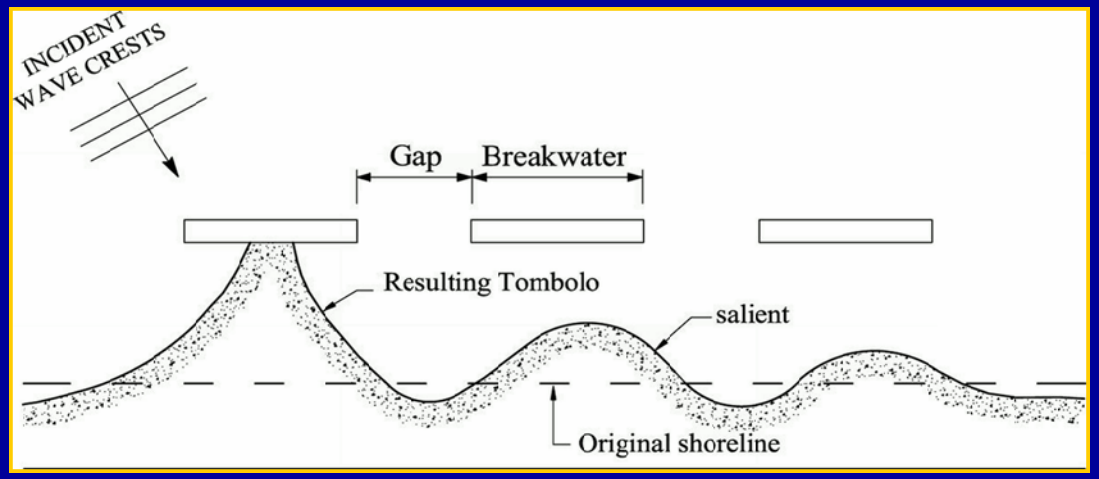
2006: D'Muara Marine Park's construction.

Currently: mangrove forest covers only 800m of the shoreline.



Methods and Materials



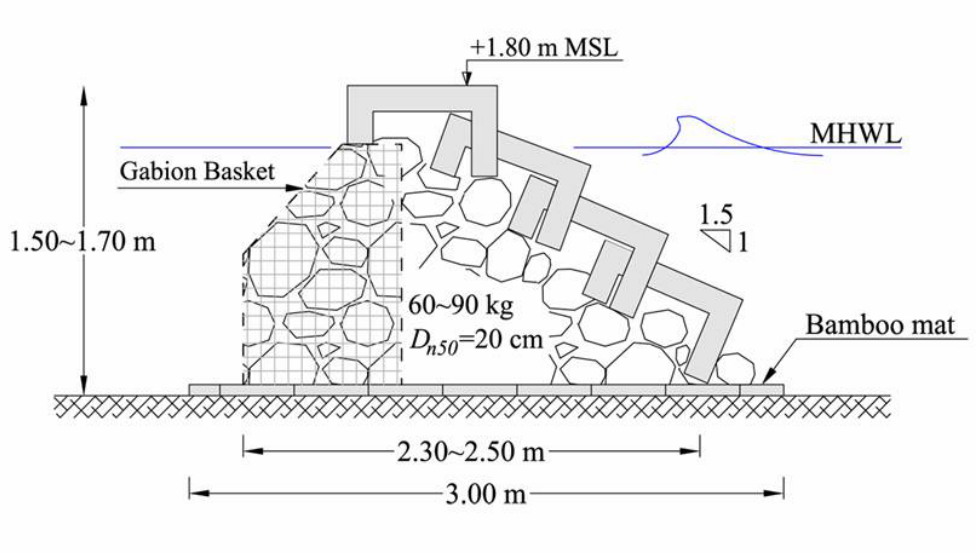


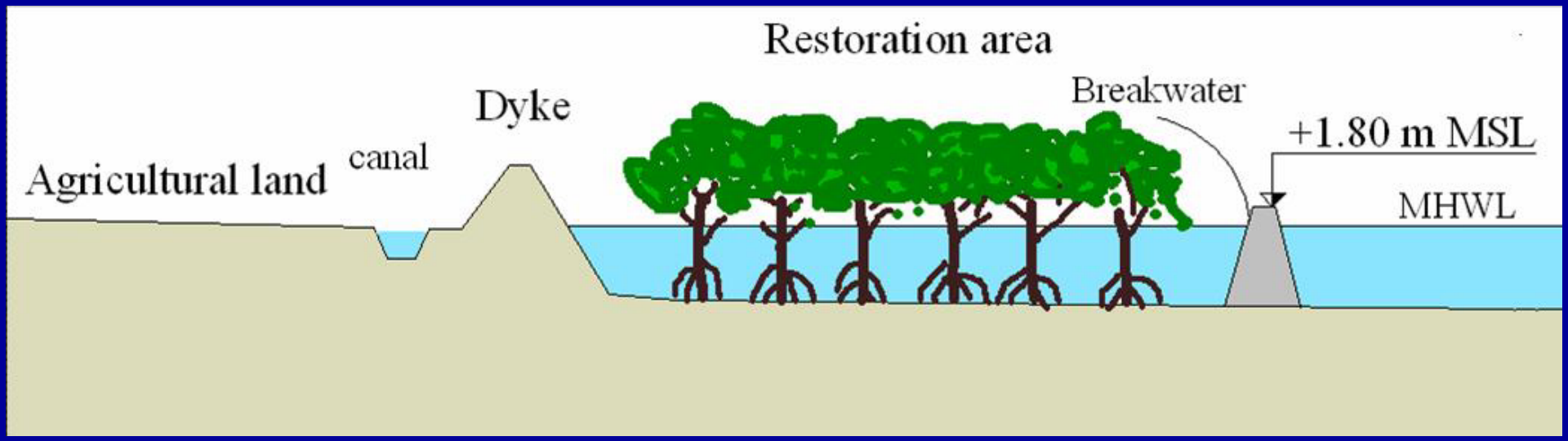
A low crested multi-structure was selected as the design.

The main purpose *of* detached breakwaters is to 1.reduce the amount of wave energy in the shoreward side (lee) *of* the breakwater by reflecting, dissipating and diffracting incident waves, & 2.To encourage sediments deposition in the restoration area

Methods and Materials

The crest heights of the structures ~ 1.5 m - 1.7 m giving a crest level of about +1.80m MSL.

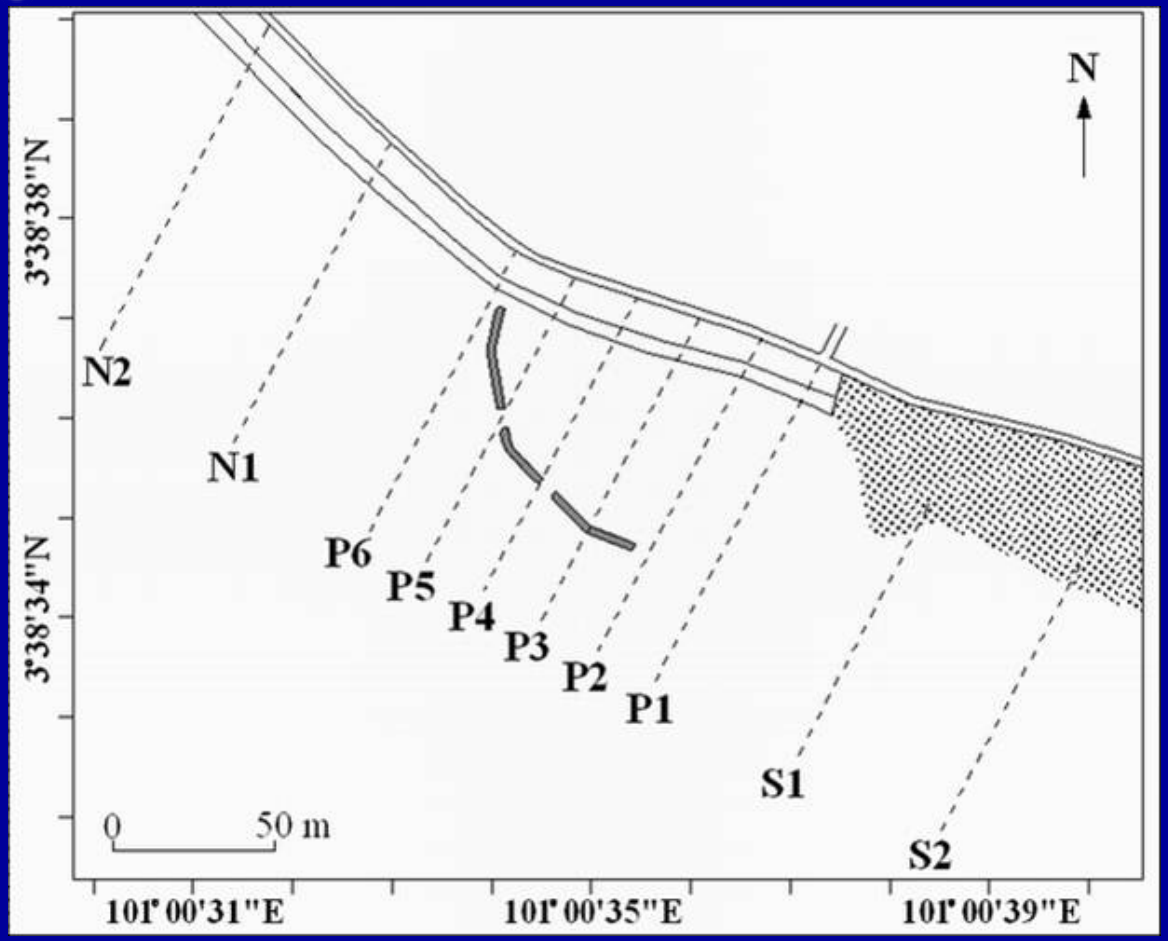




$K_t = 0.4$ (typical storm condition at MHWL)

Methods and Materials

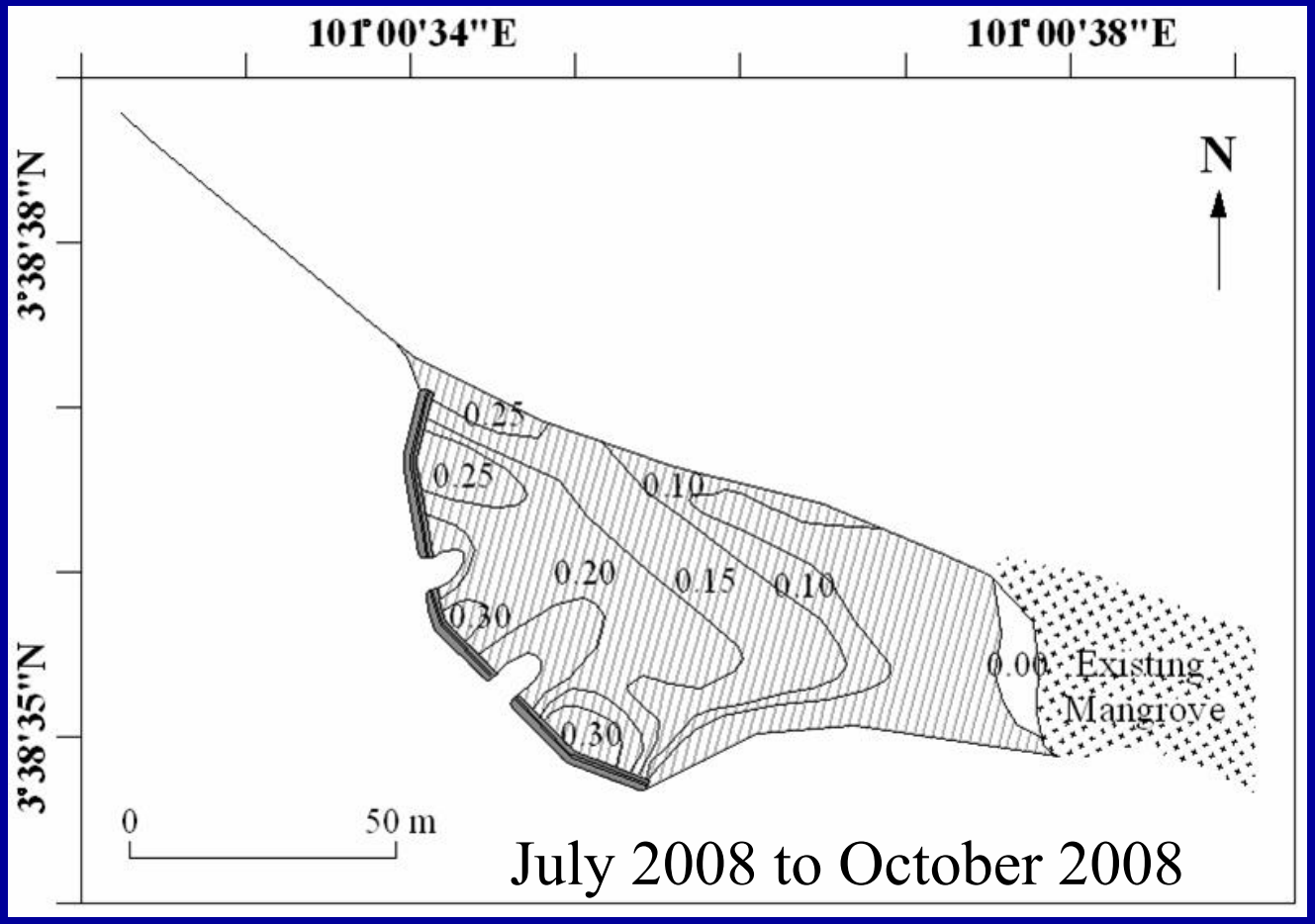
Monitoring Plan



The survey was comprised of 10 profile lines perpendicular to the shoreline and 2 long-shore profiles.

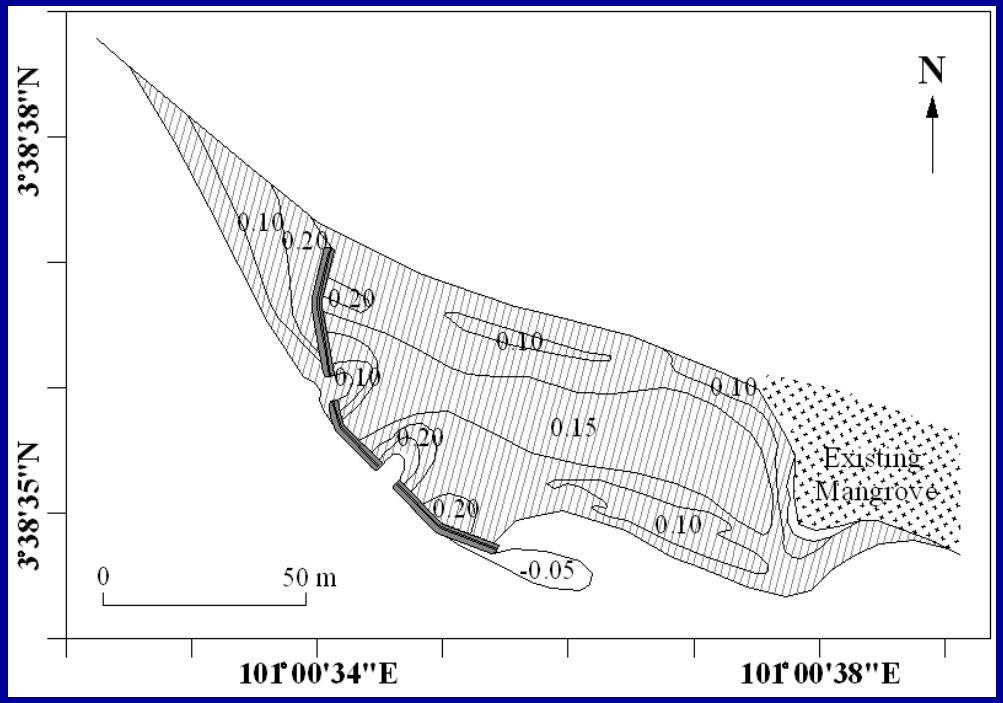
Results: Beach response

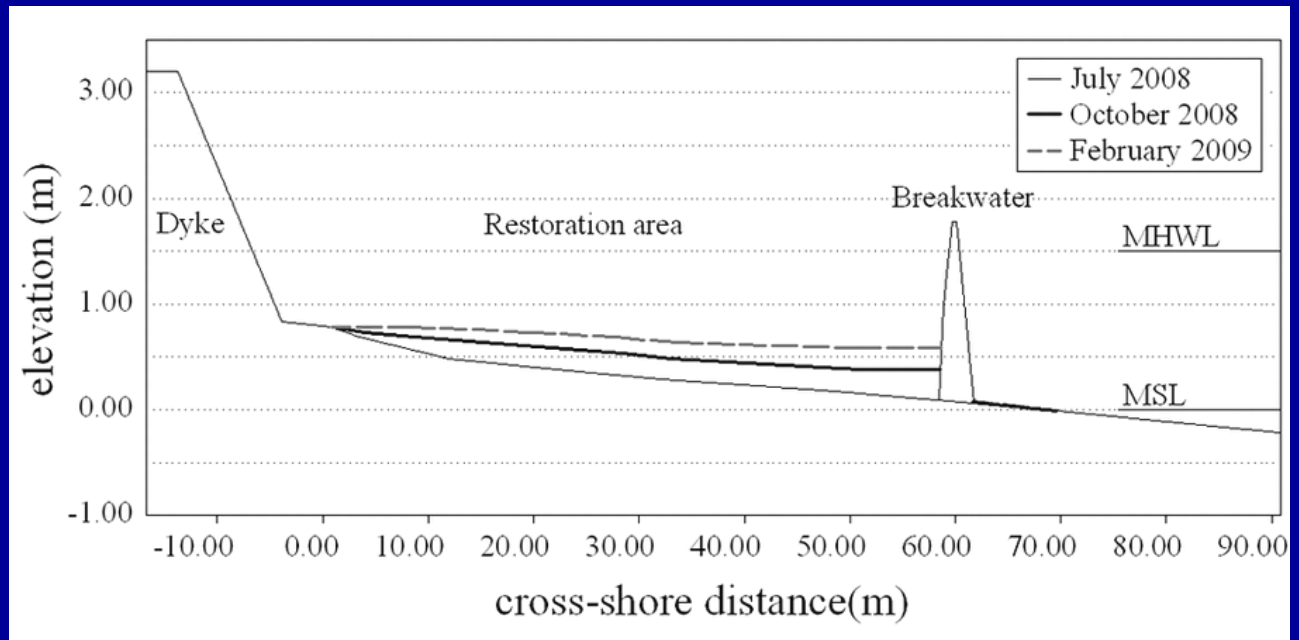
Volumetric sediment deposition amounted to 0.137 m^3/m^2 in 4 months after completion of the construction.



Results: Beach response

From October 2008 to February 2009 a substantial accretion occurred in the vicinity of the breakwater; an area of about 7220 m^2 has been covered by sediments.

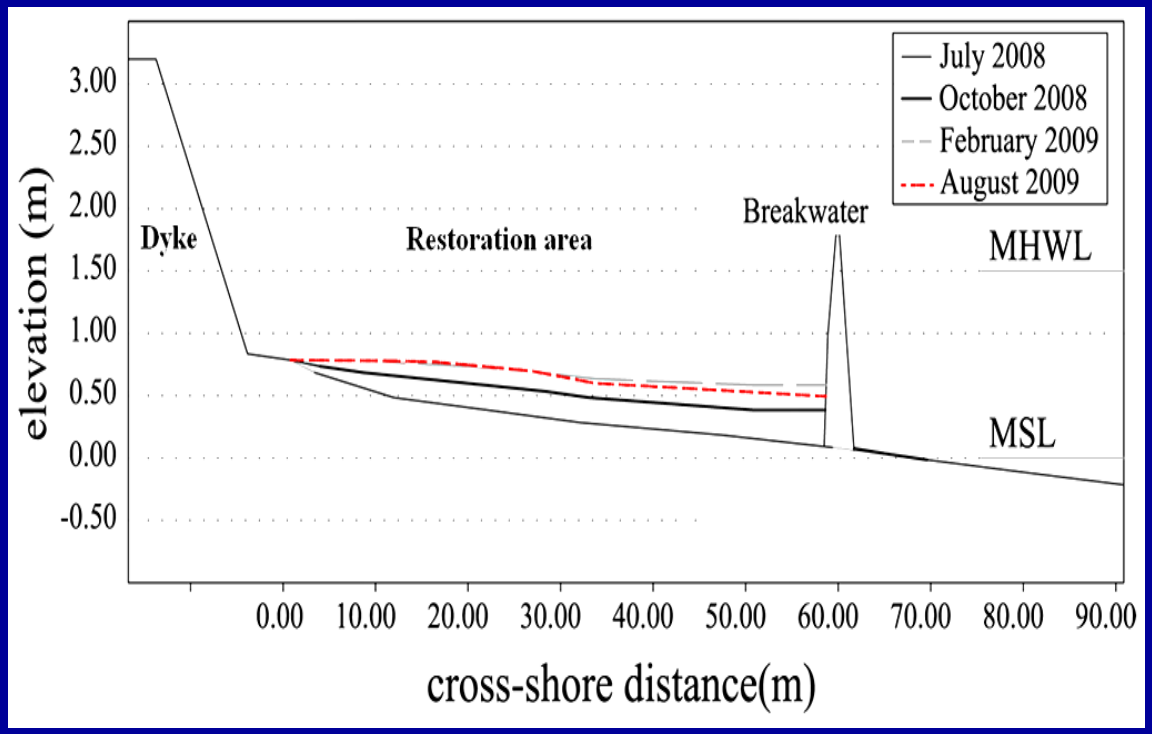




Results: Beach response

A slight change in the cross-shore profile from February 2009 to August 2009

An average elevation of +0.71 m MSL was achieved in the restoration area which is the minimum target elevation expected to provide the optimum hydrologic regime for mangrove restoration



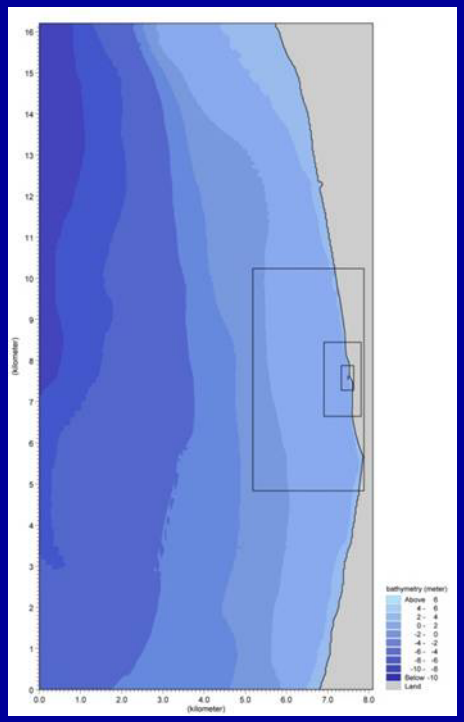
Results: Beach response

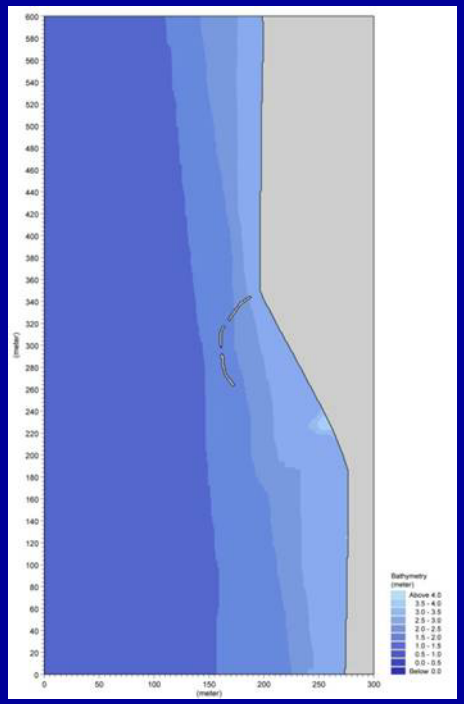
The sedimentation in the shoreward side of the coastal defence is expected to reach a steady state in 2-3 years in view of the fact that the established mangroves will improve sediment accretion and stabilisation.

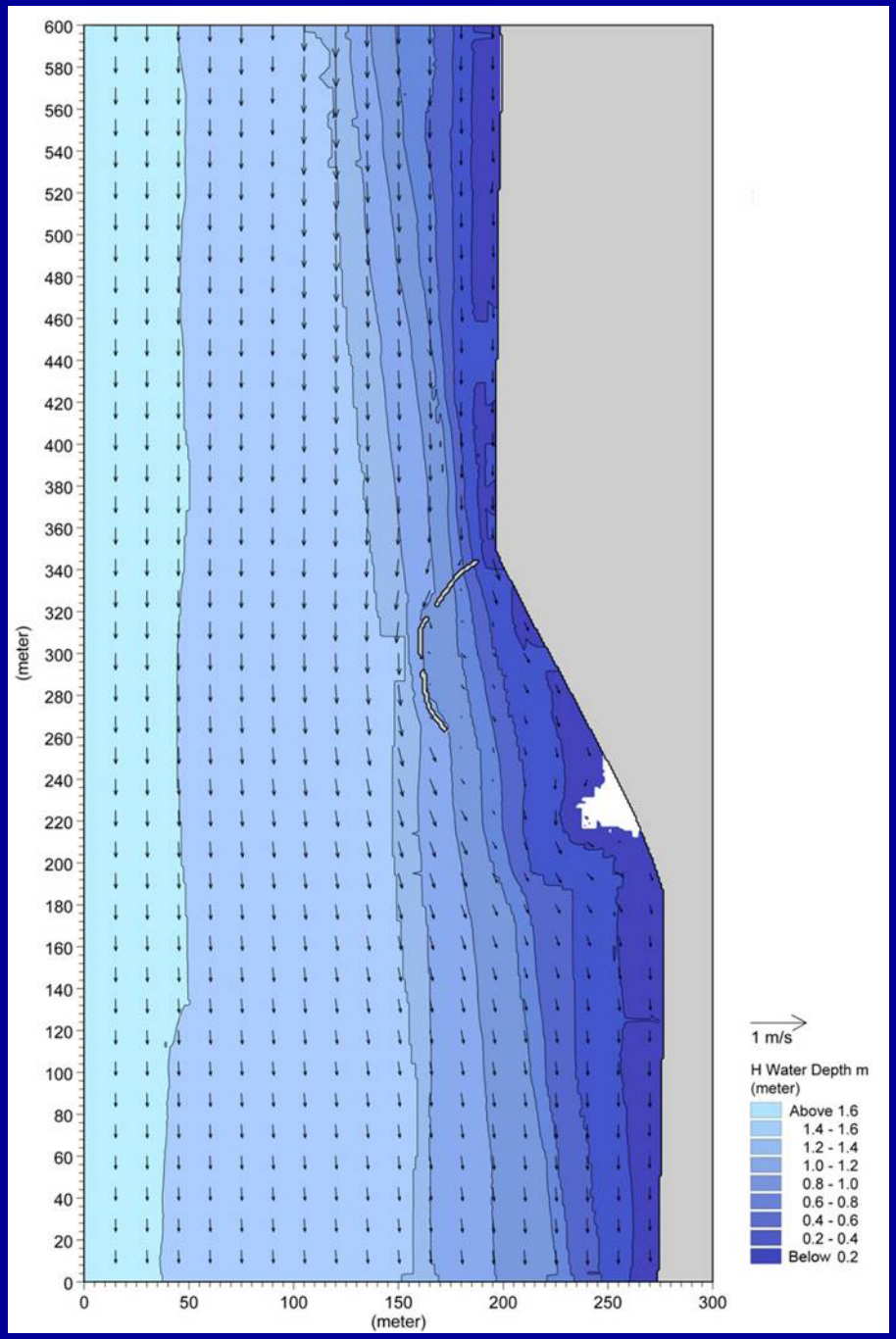
Results: Modified L-Block armour units

No substantial damage was observed during last one year of monitoring. This is due mainly to the fact that the Modified L-Block layer can adapt itself for structural settlements.

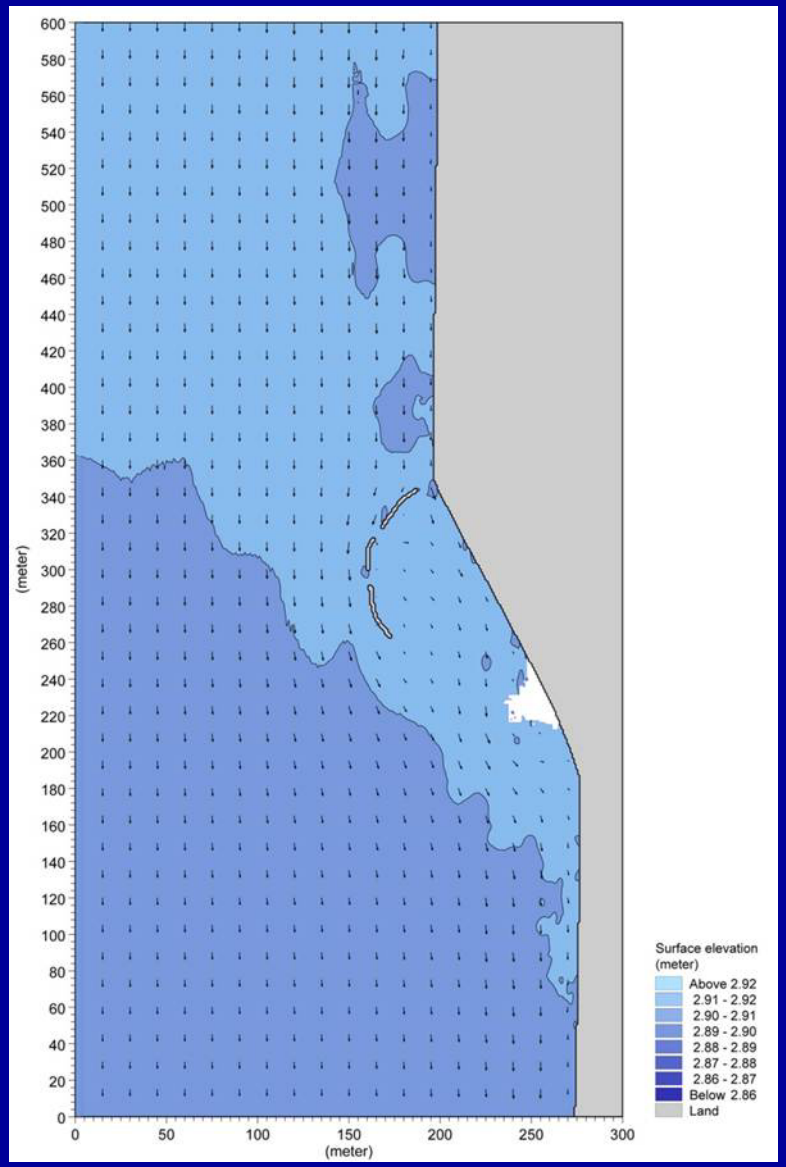
Results:
MIKE simulations

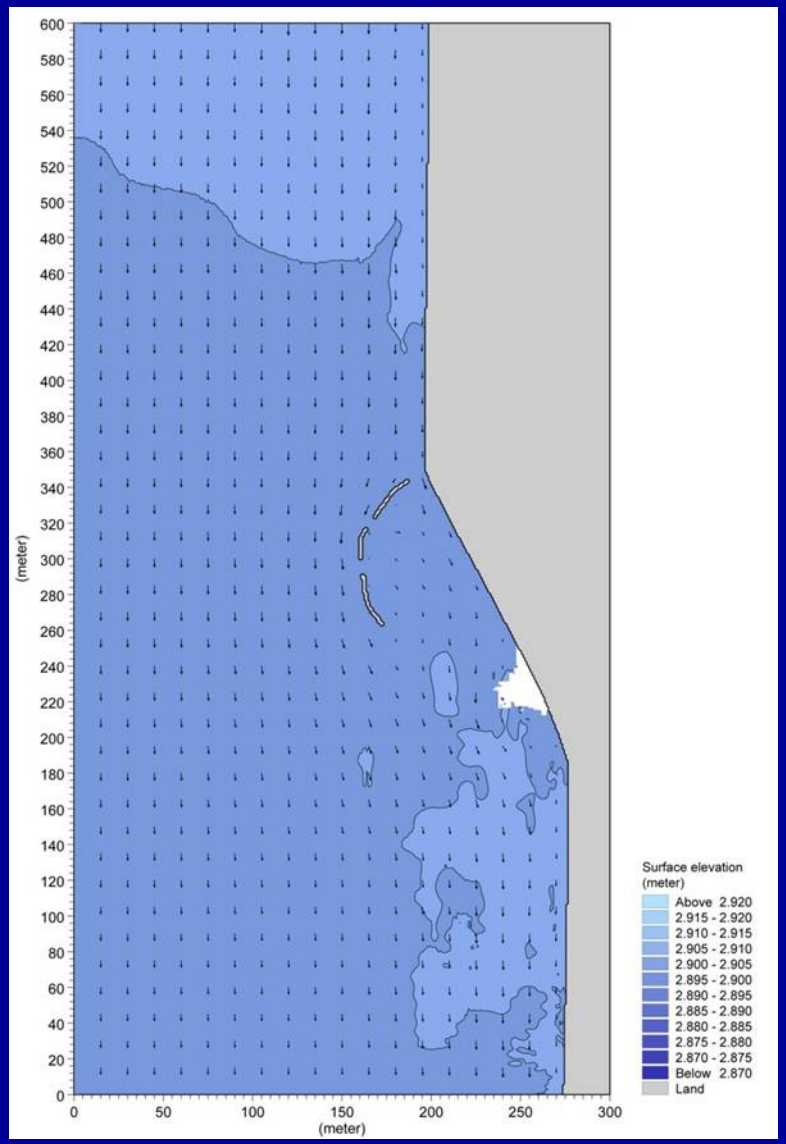






Results: MIKE simulations





Conclusions: Project Achievement

Mangrove reestablishment: Planted mangroves seedlings in the restoration area have better chance of survival once the sediments had stabilized. Mangroves recruits had better growth rates.

Breakwater: Performed as planned i.e. reduce wave energy and encourage the build up of sediments.

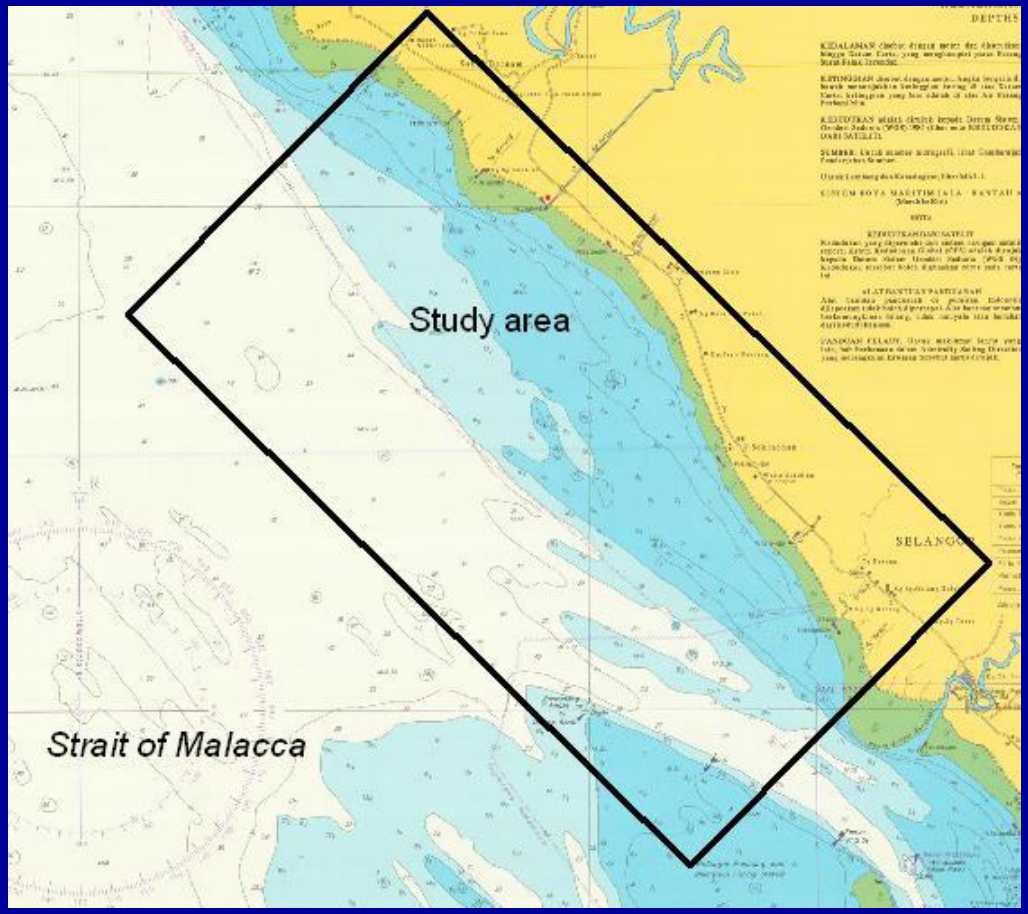
Overall: Benefits other than costal restoration are training locals. Continuous monitoring to replace dead saplings and maintenance of the breakwater.

Conclusions: MIKE Simulations

Current speed induced by wind and tide variation was lower on shoreward side of the breakwaters.

It was expected that sediment accretion occur at the area protected by the breakwater.

The structure reduces the current intensity only in the protected area and it does not affect the long-shore drift in the whole area



Conclusions: Further Work

Further work to be carried out:

- to continue with field data collection and monitoring of existing restored area & to extend the area of coastal restoration work

- to carry out large scale model tests on the performance of breakwater system

- to extend the area of coastal restoration work

THANK YOU

Collaborators:
Forestry Research Institute of Malaysia (FRIM)
Universiti Technologi Petronas, Malaysia (UTP)