

MORPHOLOGICAL CHANGES AT DESARU BEACH, JOHOR

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## ABSTRACT

East coast of Peninsular Malaysia experiencing serious coastal erosion due to the influence of the Northeast monsoon. This study mainly investigates the beach profiles changes of Desaru Beach. The scope of the study focused on accretion and erosion process of beach profile using short-term and long-term data set. The short term field data collection was carried out in three different periods through August, September and October 2016. While, the long term analysis used current data collection and previous collected data since 2013. Beach profiles were measured using Real Time Kinematic Global Positioning System (RTK-GPS) technique. Samples of sediment were also collected and analysed to determine the sediment grain size distribution. Sediment samples analysis showed that the beach consist of uniform sediment. The median size of sediment at the beach is 0.35mm. The short-term results indicated that the beach profiles eroded on August 2016 and slowly accreted towards October 2016. For long-term analysis, the comparisons between mid-year annual changes showed equal accretion and erosion process from 2013 to 2015. However, there were significant erosion occurred between 2015 and 2016. Another long-term analysis was seasonal monsoon changes from December 2013 to December 2015. There were gradual erosion occur throughout the period with severe erosion occurred on December 2015. From long-term analysis, Desaru Beach was severely eroded in December 2015 and the beach profile showed that the shoreline is retreat.

## ABSTRAK

Pantai Timur Semenanjung Malaysia mengalami hakisan pantai yang serius disebabkan oleh pengaruh monsun Timur Laut . Kajian ini terutamanya mengkaji perubahan profil Pantai Desaru. Skop kajian ini tertumpu kepada proses pertambahan dan hakisan profil pantai menggunakan data jangka pendek dan jangka panjang. Pengumpulan data lapangan jangka pendek telah dijalankan dalam tiga tempoh yang berbeza antara Ogos, September dan Oktober 2016. Manakala, analisis jangka panjang data semasa dan data yang telah dikumpul sebelumnya sejak 2013. Profil pantai diukur menggunakan teknik *Real Time Kinematic Global Positioning System* (RTK-GPS). Beberapa Sampel sedimen juga telah diambil dan dianalisis untuk menentukan taburan saiz sedimen. Hasil analisa menunjukkan bahawa keseluruhan pantai terdiri daripada sedimen seragam. Saiz median sedimen di pantai adalah 0.35 mm. Keputusan jangka pendek menunjukkan bahawa profil pantai terhakis pada Ogos 2016 dan bertambah menuju Oktober 2016. Untuk analisis jangka panjang, perbandingan antara pertengahan tahun menunjukkan proses pertambahan dan hakisan yang seimbang daripada 2013 hingga 2015. Bagaimanapun, terdapat hakisan yang ketara berlaku di antara 2015 dan 2016. Satu lagi analisis jangka panjang ialah antara musim monsun dari Disember 2013 hingga Disember 2015. Terdapat hakisan secara beransur-ansur berlaku sepanjang tempoh itu dengan hakisan teruk berlaku pada Disember 2015. Hal ini menunjukkan Pantai Desaru mengalami hakisan teruk pada Disember 2015 dan jarak pantai sedang memendek.

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**LIST OF ABBREVIATIONS**

ACD	Admiralty Chart Datum
ASTM	American Society of Testing Materials
dGPS	Differential Global Positioning System
DID	Department of Irrigation and Drainage Malaysia
GPS	Global Positioning System
LSD	Land Survey Datum
METMalaysia	Malaysian Meteorological Department
MHHW	Mean Higher High Water
MHLW	Mean Higher Low Water
MHWS	Mean High Water Spring
MLHW	Mean Lower High Water
MLLW	Mean Lower Low Water
MLWS	Mean Low Water Spring
MSL	Mean Sea Level
RTK-GPS	Real Time Kinematic Global Positioning System

**LIST OF SYMBOLS**

a	Initial distance
b	Final distance
C	Wave celerity
$C_u$	Coefficient of uniformity
$C_c$	Coefficient of gradation
$D_{10}$	10% grain size
$D_{30}$	30% grain size
$D_{50}$	50% grain size (median)
$D_{60}$	60% grain size
f	Wave frequency
H	Wave height
km/h	Kilometre per Hour
L	Wave length
m	Metre
n	Number of interval
s	Second
T	Wave period
t	Time

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Overview

Malaysia is known as one of Asian country which located near the equator that experience hot and humid climates throughout the year. Since Malaysia is surrounding by sea, the morphology of the coastal zone keep changing. In other word, coastline all over Malaysia is facing erosion especially during monsoon season. The total length Malaysia's coastline is 4809 km which consist of 2031 km for Peninsular Malaysia and 2778 km for East Malaysia respectively (refer Figure 1.1).



**Figure 1.1:** Malaysia coastlines and its length (DID, 2015)

Malaysia experienced two monsoons season, southwest monsoon which occurs between March and September, as the sun directly strikes above the equator, the land mass of Asia heat more than the Indian Ocean. The northeast monsoon wind which lasts from October to January occurs when the tilt of sun ray to the south of Equator. The temperature difference between the land mass and the Indian Ocean creates wind that draws moist air from the ocean over the highland of the basin (Malaysian Wetland Working Group, 1988).

## **1.2 Background of Study**

Johor is one of the coastal states in Malaysia with the longest coastline facing the South China Sea in the east, the Strait of Malacca in the west and the Strait of Johor in the south. Coastal resources are the main source of income towards industrialization and economic development in Johor especially along the coastal area.

Meanwhile, Desaru is situated on the southeast coast of the district. It is located approximately 88 km east of Johor Bahru, on the South China Sea. Desaru is very close to the developing country, Singapore. Desaru is highly seasonal, with monsoon winds and rains lashing over for a period from November to February every year resulting in high waves. It is strongly influenced by the northeast monsoon as it fully exposed to South China Sea

The seasonal variation experienced by Peninsular Malaysia has caused erosion and accretion to the beach morphology in Malaysia and Desaru beach is one of 29 beaches in Johor that largely eroded (DID, 2015).



### **1.3 Problem Statement**

As Desaru is very popular for its sandy glittering beach, erosion becomes a significance issue. According to The Coastal Resources Management Plan for South Johore, a stretch of Desaru area has been identified as critically eroding but recently only monitoring being done as there is only little construction on land. Control planning must be taken into account if the construction alongshore of Desaru is getting intense.

If waves and winds due to monsoon season contribute more for Desaru beach erosion, no construction should be allowed. It is because construction alongshore the beach gives higher potential impact on beach erosion. Thus, there will some effects on tourism activities.

### **1.4 Objectives of the Study**

The aim of this project is to determine changes in beach morphology. To achieve the aim, there are three main objectives:

- i. To determine the sediment grain-size distribution
- ii. To analyse the erosion and accretion of beach profile in short-term period.
- iii. To analyse the beach profile changes in long-term period.

## 1.5 Scope of Study

The scopes of the project are:

- i. Area of study Desaru Public Beach, Pengerang, Johor.
- ii. Sediment analysis using sieve analysis to determine sediment size distribution at the area.
- iii. Beach profile topography measurement at Desaru Beach using Real Time Kinematic Global Positioning System (RTK-GPS).
- iv. Short-term study was conducted from August to October 2016 at spring tide only (monthly).
- v. Long-term study using recent and previous data set since 2013 (annually).

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