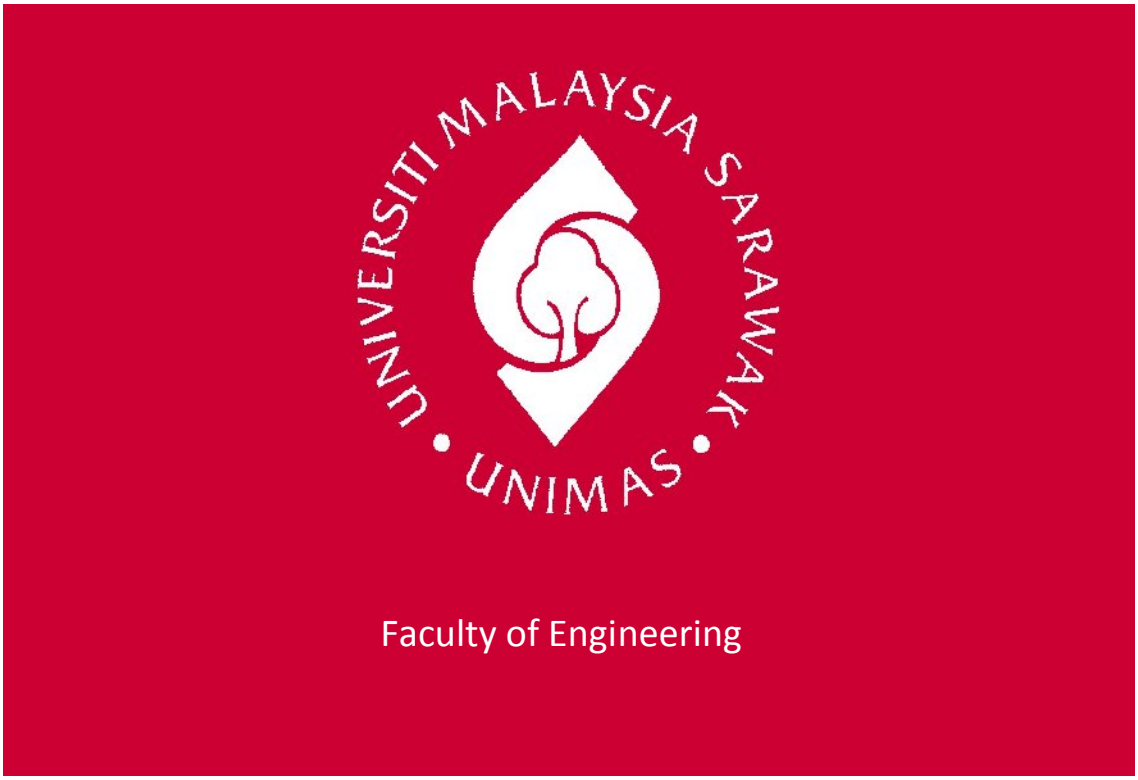

DREDGING AND RECLAMATION OF SARAWAK RIVER ESTUARY WITH THE APPLICATION OF SWAN

Ahmadi Bin Hashim

Bachelor of Engineering with Honours

(Civil Engineering)

2009

UNIVERSITI MALAYSIA SARAWAK

BORANG PENGESAHAN STATUS TESIS *

JUDUL: DREDGING AND RECLAMATION OF SARAWAK RIVER ESTUARY WITH THE APPLICATION OF SWAN

SESI PENGAJIAN: 2008 / 2009

Saya **AHMADI BIN HASHIM**

(HURUF BESAR)

mengaku membenarkan tesis * ini disimpan di Pusat Khidmat Maklumat Akademik, Universiti Malaysia Sarawak dengan syarat-syarat kegunaan seperti berikut:

1. Tesis adalah hak milik Universiti Malaysia Sarawak.
2. Pusat Khidmat Maklumat Akademik, Universiti Malaysia Sarawak dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Membuat pendigitan untuk membangunkan Pangkalan Data Kandungan Tempatan.
4. Pusat Khidmat Maklumat Akademik, Universiti Malaysia Sarawak dibenarkan membuat salinan tesis ini sebagai pertukaran antara institut pengajian tenggi.
5. ** Sila tandakan (／) di kotak yang berkenaan

☐	SULIT	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972).
☐	TERHAD	(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/ badan di mana penyelidikan dijalankan).
☑	TIDAK TERHAD	

Disahkan Oleh:

(TANDATANGAN PENULIS)

Alamat Tetap: KG SEMATANG PINANG,
06600 KUALA KEDAH. KEDAH.

Tarikh : 23/05/2009

(TANDATANGAN PENYELIA)

PUAN NORAZLINA BT BATENI
Nama Penyelia

Tarikh : 23/05/2009

CATATAN : * Tesis dimaksudkan sebagai tesis bagi Ijazah Doktor Falsafah, Sarjana dan Sarjana Muda.

** Jika tesis ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa / organisasi berkenaan dengan menyatakan sekali sebab dan tempoh tesis ini perlu dikelaskan sebagai SULIT atau TERHAD

" I hereby declare that I have read this report and in my opinion this report is sufficient in terms of scope and quality for the purpose for award of the Degree of Bachelor of Engineering (Civil) with Honours ".

Signature	:	……..…….....
Name of Supervisor	:	PUAN NORAZLINA BT BATENI
Date	:	23th MAY 2009

"I hereby declare that this report is prepared personally with my own effort unless references that have been cited accordingly in any part of the report".

Signature	:	…….....
Name of Author	:	AHMADI BIN HASHIM
Date	:	23th MAY 2009

APPROVAL SHEET

This project report attached here to, entitles **"DREDGING AND RECLAMATION OF SARAWAK RIVER ESTUARY WITH THE APPLICATION OF SWAN"** prepared and submitted by **AHMADI BIN HASHIM (13672)** as a partial fulfillment of the requirement for the Degree of Bachelor of Engineering with Honours in Civil Engineering is hereby read and approved by:

_____ 23th MAY 2009

PUAN NORAZLINA BT BATENI Date

SUPERVISOR

DREDGING AND RECLAMATION OF SARAWAK RIVER ESTUARY WITH THE APPLICATION OF SWAN

AHMADI BIN HASHIM

This Thesis Is Propose To

Faculty of Engineering, Universiti Malaysia Sarawak

For Fulfilment of the Requirements for Bestowal

The Degree of Bachelor of Engineering with Honours

(Civil Engineering)

2009

This project report is dedicated to my beloved mother and father, Patimah Bt Saad and Hashim Bin Long, and also to all my family members

ACKNOWLEDGEMENT

Bismillah. First and foremost, Alhamdulillah, thanks to Allah, the most gracious and the most merciful who has enabled me to complete this tough and challenging task. Without His blessing, I might not be able to complete this final year project. Secondly, very big thanks to my supervisor, Mdm Norazlina Bt Bateni for the support, advices and help me a lot in learning the SWAN application. Her help, guidance, supervision and knowledge shared will not soon forgotten.

My appreciation sincerely also to the following departments; Department of Irrigation and Drainage (DID), Malaysian Meteorological Services (MMS) and Department of Environmental (DOE) for their permission to give the data information to carry out this project study.

Very special thanks to my parent and my family for being supportive and help me a lot. Last but not least, thanks for all my friends who had inspirited me during the completion this project study.

ABSTRACT

Sarawak River estuary faced critical erosion by ocean surface wave nowadays. Not only exposed to high energy wave condition from South China Sea, but also due to navigation channel. Hence, wave models are needed to control and then overcome this problem. Using the SWAN (Simulating WAve Nearshore) wave modeling, the physical wave parameters were investigated to determine the wave condition nearshore. This investigation is carried out to predict the wave generation, refraction and energy dissipation at Sarawak River estuary with dredging and reclamation bathymetry, and using the previous data of local wind and wave. The bathymetry map is digitized in SURFER where dredging and reclamation is visualized to view the bottom data. The wave model was developed for Annual, Northeast Monsoon and Southwest Monsoon wave condition. Design waves are analyzed using statistical method of short term and long term analysis. Short term analysis is presented by significant wave height of average height of the one third highest waves (H1/3), while, long term analysis comprises of extreme value from Gumbel and Weibull statistical distribution analysis. The outputs from this model are significant wave height (H_s), mean wave period (Tm01) and wave direction (Dir) for each chose location. The H_s, Tm01 and Dir are different for each location.

ABSTRAK

Hakisan muara sungai pada asasnya adalah proses semulajadi yang disebabkan oleh tenaga ombak dari lautan. Masalah hakisan ini menjadi semakin kritikal di muara Sungai Sarawak sejak akhir-akhir ini. Bukan sahaja terdedah kepada tenaga ombak yang tinggi dari Laut China Selatan malah muara Sungai Sarawak mengalami hakisan disebabkan oleh laluan kapal dagang untuk berlabuh. Untuk mengawal dan mengatasi masalah ini, kajian tentang model ombak adalah sangat diperlukan. Melalui model ombak SWAN (Simulating WAve Nearshore), fizikal parameter ombak bagi muara Sungai Sarawak dikaji. SWAN adalah model ombak generasi ketiga yang dimajukan untuk meramal keadaan ombak bagi kawasan cetek persisiran pantai. Dengan menggunakan data ombak dan angin yang sedia ada, kajian ini dijalankan untuk meramal pembentukan ombak, penyebaran ombak dan penyebaran tenaga ombak di muara Sungai Sarawak yang merangkumi faktor pendalaman dan penambakan laut.. Kajian juga menganalisis ramalan ombak untuk jangka pendek dan jangka panjang. Ramalan jangka pendek dikaji menggunakan purata 1/3 ketinggian daripada ketinggian paling tinggi manakala ramalan jangka panjang menggunakan nilai ekstrim statistik Gumbel dan Weibull. Keputusan daripada model ini adalah ketinggian ombak (H_s), purata tempoh masa (Tm01) dan arah ombak (Dir) bagi setiap kedudukan yang dililih. H_s, Tm01 dan Dir adalah berbeza bagi setiap kedudukan.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ANN	-	Annual Monsoon
DID	-	Department of Irrigation and Drainage
GUI	-	Graphical User Interface
HAT	-	Highest Astronomical Tide
EIA	-	Environmental Impact Assessment
MMS	-	Malaysian Meteorological Services
NEM	-	Northeast Monsoon
SSMO	-	Summary of Synoptic Meteorological Observations
SWAN	-	Simulating Wave Nearshore
SWM	-	Southwest Monsoon
VOSP	-	Voluntary Observer Ship Programme

LIST OF SYMBOLS

σ	-	Wave radian frequencies
Γ	-	Coefficient of overall wave steepness
A	-	Amplitude
C_{bottom}	-	Bottom coefficient
d	-	Water depth
E_{tot}	-	Total wave energy
f	-	Wave frequency
H	-	Wave height
Hi	-	Individual wave height
H_s	-	Significant wave height
k	-	Wave number
L	-	Wave length
$S_{ds\ br\ tot}$	-	Mean rate of energy dissipation per unit horizontal area
T	-	Wave period
$\bar{x}$	-	Mean

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Introduction

The coastal zones are some of the most dynamic environments on earth. The majority of the population in Malaysia lives in coastal areas. In Sarawak more than 80% of the population live along the 800 km coastline, the size and shape of which is constantly changing. Such things as daily tides, mangrove forest, storm waves and tidal flats are found only on the coast. The strip of land that straddles the coastline contains some of the most productive and valuable habitats of the world. Coastal zones are unique but also very sensitive ecological systems with great value in economic, aesthetic, social, environmental conservation sense.