

IMPACT OF SUCTAN MAHMUD AIRPORT TO THE COAST

ZULIARNI BT ZAHUDI

**FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU**

2010

IMPACT OF SULTAN MAHMUD AIRPORT DEVELOPMENT TO THE COAST

By

ZULIARNI BT ZAHUDI

**Research Report submitted in partial fulfillment of
The requirements for the degree of
Bachelor of Science (Marine Science)**

**Department of Marine Science
Faculty of Maritime Studies and Marine Science
UNIVERSITI MALAYSIA TERENGGANU
2010**



**DECLARATION AND VERIFICATION REPORT
 RESEARCH PROJECT I AND II**

It is hereby declared and verified that this research report entitled:
 Impact Of Sultan Mahmud Airport Development to the Coast by ZULIARNI BINTI
 ZAHUDI, Matric No. UK 15398 have been examined and all errors identified have
 been corrected. This report is submitted to the Department of Marine Science as
 partial fulfillment towards obtaining the Degree of Bachelor of Science (Marine
 Science), Faculty of Maritime Studies and Marine Science, Universiti Malaysia
 Terengganu.

Verified by: 

PROF. MADYA DR. ROSNAN YAACOB
 Pensyarah
 Jabatan Sains Marin
 Fakulti Pengajian Maritim dan Sains Marin
 Universiti Malaysia Terengganu (UMT)
 Principal Supervisor

Name: Assoc. Prof. Dr. Rosnan Yaacob

Official stamp:

Date: 8/4/2010

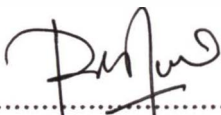
.....

Second Supervisor

Name: Dr. Nor Antonina Abdullah

Official stamp:

Date:



Head of Department of Marine Science

Name: Dr. Razak Zakariya

Official stamp:

Date: 8/4/10

DR. RAZAK ZAKARIYA
 Ketua Jabatan Sains Marin
 Fakulti Pengajian Maritim dan Sains Marin
 Universiti Malaysia Terengganu
 (UMT)

ACKNOWLEDGEMENT

First of all, I would like to express my greatest appreciation to Allah S.W.T for his blessing which enable me to finish my study. Also my appreciation to my supervisor, Associate Professor Dr. Rosnan Yaacob for his valuable guidance, advice, support, generosity and time. Without his supervision, this study and project including the presentation and report might not have been possible. I am also indebted to my honorable second supervisor also as a advisor, Dr. Nor Antonina Abdullah for her helpful comment and encouragement.

Heartfelt thanks are accorded to the staff Universiti Malaysia Terengganu (UMT) especially to FMSM staff for their helping me whether during sampling or laboratory work, En. Suliman and En. Raja. My appreciation also forward to my mother, Puan Sabariah Saffie and all my beloved friends, Mohamad Hanif b. Ibrahim, Siti Norjannah Johari, Siti Afzan Ani Moslim and Siti Ramizah Daud. They are so kind and always with me during my sampling and I really appreciate that. Their encouragement and support has enabled me to complete this study until the end. All of your deeds are infinite and can only repay by Allah S.W.T. Thanks my friend.

Last but not least to master student, Zaini, Aisyah and Effi Helmi for their guidance and advice to me to complete my thesis and project. Thanks a lot to sharing the information and knowledge also to guide me become good student.

LIST OF CONTENTS

ACKNOWLEDGEMENT	i
LIST OF CONTENTS	ii
LIST OF TABLES	v
LIST OF FIGURES	vii
LIST OF SYMBOLS AND ABBREVIATION	ix
LIST OF APPENDICES	x
ABSTRACT	xi
ABSTRAK	xii
1.0 INTRODUCTION	1
1.1 Justification	3
1.2 Objectives	3
2.0 LITERATURE REVIEW	
2.1 Coastal Development	4
2.2 Net Shore Drift Direction	4
2.3 Coastal Sediment	5
2.4 Sediment Characteristic	5
2.5 Beach Profile	6

3.0 METHODOLOGY

3.1 Study Area	7
3.2 Beach Profile Measurement	10
3.3 Sediment Sampling	10
3.3.1 Dry Sieving Analysis	10
3.3.2 Calculation of Sedimentological Parameter	11
3.4 Physical Data Collection	13
3.5 Net Shore Drift Direction Determination	13

4.0 RESULTS

4.1 Physical Parameter	14
4.1.1 Wind Speed	14
4.1.2 Rainfall Distribution	16
4.1.3 Tides	18
4.2 Statistical Analysis	20
4.2.1 Mean	21
4.2.2 Sorting	24
4.2.3 Skewness	27
4.3 Beach Profile Analysis	30
4.3.1 Beach Slope	40
4.3.2 Beach Width	42

5.0 DISCUSSION	
5.1 Physical Parameter	43
5.2 Statistical Analysis	44
5.3 Beach Profile Analysis and Net Shore Drift Direction	47
5.4 Net Shore Drift (NSD) Direction	49
5.4.1 Mean	49
5.4.2 Sorting	50
5.4.3 Beach Width	51
5.4.4 Beach Slope	52
5.5 The Consequences of Kuala Terengganu Erosion	55
6.0 CONCLUSION	57
REFERENCES	58
APPENDICES	60
CURRICULUM VITAE	65

LIST OF TABLES

Table		Page
3.1	Position at all sampling station	9
4.1.1	Average wind speed (ms^{-1}) from January until December 2009	15
4.1.2	Average Rainfall Distribution (mm) from January until December 2009	17
4.1.3	Monthly Average of Tides Cycle from January until December 2009.	19
4.2.1 (a)	Average Mean Value at Sampling Station on August 2009	21
4.2.1 (b)	Average Mean Value at Sampling Station on November 2009	22
4.2.1 (c)	Average Mean Value at Sampling Station on December 2009	23
4.2.2 (a)	Average Sorting Value at Sampling Station on August 2009	24
4.2.2 (b)	Average Sorting Value at Sampling Station on November 2009	25
4.2.2 (c)	Average Sorting Value at Sampling Station on December 2009	26
4.2.3 (a)	Average Skewness Value at Sampling Station on August 2009	27
4.2.3 (b)	Average Skewness Value at Sampling Station on November 2009	28
4.2.3 (c)	Average Skewness Value at Sampling Station on December 2009	29
4.3.1 (a)	Beach Slope from August until December 2009	40
4.3.1 (b)	Degree of Beach Slope from August until December 2009	41
4.3.2	Beach Width from August until December 2009	42
5.2.1	Average Statistical Parameter of Grain Size Distribution at All Station on August 2009	45
5.2.2	Average Statistical Parameter of Grain Size Distribution at All Station on November 2009	45
5.2.3	Average Statistical Parameter of Grain Size Distribution at All Station on December 2009	46

5.4 a	The arrangement of mean value for all station	49
5.4 b	The arrangement of sorting value for all station	50
5.4 c	The arrangement of beach width for all station	51
5.4 d	The arrangement of beach slope for all station	52

LIST OF FIGURES

Figure		Page
3.1	Study Area around Kuala Terengganu Airport Beach	8
4.1.1	Average wind speed (ms^{-1}) from January until December 2009	15
4.1.2	Average Rainfall Distribution (mm) from January until December 2009	17
4.1.3	Monthly Average of Tides Cycle from January until December 2009	19
4.3.1	Beach Profile at Station 1 from August until December 2009	30
4.3.2	Beach Profile at Station 1 from August until November 2009	31
4.3.3	Beach Profile at Station 1 from November until December 2009	31
4.3.4	Beach Profile at Station 2 from August until December 2009	32
4.3.5	Beach Profile at Station 2 from August until November 2009	32
4.3.6	Beach Profile at Station 2 from November until December 2009	33
4.3.7	Beach Profile at Station 3 from August until December 2009	33
4.3.8	Beach Profile at Station 3 from August until November 2009	34
4.3.9	Beach Profile at Station 3 from November until December 2009	34
4.3.10	Beach Profile at Station 4 from August until December 2009	35
4.3.11	Beach Profile at Station 4 from August until November 2009	35
4.3.12	Beach Profile at Station 4 from November until December 2009	36
4.3.13	Beach Profile at Station 5 on August 2009	36
4.3.14	Beach Profile at Station 6 on August 2009	37
4.3.15	Beach Profile at Station 7 from August until December 2009	37

4.3.16	Beach Profile at Station 7 from August until November 2009	38
4.3.17	Beach Profile at Station 7 from November until December 2009	38
4.3.18	Beach Profile at Station 8 from November until December 2009	39
4.3.19	Beach Profile at Station 9 from November until December 2009	39
5.3	Net Shore Drift Direction along Kuala Terengganu Coastline	54

LIST OF SYMBOLS AND ABBREVIATION

Symbols:

ms^{-1} - meter per second

μm – micrometer

m – meter

mm – millimeter

g – gram

$^{\circ}$ - degree

% - percent

Abbreviation:

NSD – Net Shore Drift

HT – High Tide

MT – Mid Tide

LT – Low Tide

LIST OF APPENDICES

Appendix		Page
1.0	The characteristic of mean, sorting and skewness	60
2.0	Picture of sampling site on August 2009	61
3.0	Picture of sampling site on November 2009	62
4.0	Picture of sampling site on December 2009	63
5.0	Picture of Station 5 and 6 (lost due to degradation work)	64

ABSTRACT

Nowadays, development in the coastal area become popular and it is the focus of considerable research activity by both natural scientist and planner. This study was conducted to determine the impact due to the airport pathways development to the coast also to determine the grain size distribution and net shore drift direction in the vicinity of Kuala Terengganu airport coastline. Impact of airport pathways development can be determined by grain size analysis, beach profile measurement and net shore drift direction. Throughout this study, process that might occur on shore whether erosion or accretion also can be defined. Erosion and accretion occurred due to natural factors such as physical forces (wind, rainfall, tides, and wave) and man-made factor (breakwater, jetty, and groin). Structures constructed on the shore which is perpendicular to the shore can block and disturb the direction net shore drift. This situation can cause erosion on the one side of structure and accretion on the other side. From the study, Tok Jembal Beach (station 1 until 4) is facing erosion and Teluk Ketapang Beach (station 7 until 9) is under accretion condition. This is proven by beach profile data and grain size distribution on the sampling site which is coarse (mean value: ≤ 1) and steeper (beach slope : $>10^\circ$) than Teluk Ketapang Beach. Besides that, the erosion becomes worse especially on monsoon season when the damage of roadways and loss of vegetation by waves.

ABSTRAK

Pada masa kini, pembangunan di kawasan pantai menjadi semakin di minati ramai dan ini secara tidak langsung menjadi fokus utama kepada para saintis dan perancang untuk menjalankan kajian di kawasan tersebut. Kajian ini dijalankan bagi menentukan dan mengenal pasti kesan pembinaan dan penambahan laluan kapal terbang serta mengenal pasti taburan pasir dan arah hanyutan enapan kepada pantai di sekeliling lapangan terbang tersebut. Kesan pembinaan laluan kapal terbang tersebut dapat ditentukan dengan melakukan kajian terhadap bentuk profil pantai, taburan pasir serta arah hanyutan enapan di kawasan kajian. Melalui kajian ini, proses yang terjadi terhadap pantai tersebut samada berlaku hakisan atau timbunan dapat di ketahui. Proses hakisan dan timbunan tersebut di dorong oleh faktor-faktor semulajadi seperti faktor fizikal (angin, pasang surut, arus dan hujan) dan juga faktor manusia iaitu sebarang struktur binaan pantai (benteng pemecah ombak, jeti, groin). Struktur binaan di pantai yang mana dibina secara serenjang dengan pantai, struktur tersebut akan menyekat pergerakan arah hanyutan enapan dan ini akan menyebabkan berlaku hakisan di salah satu sisi struktur dan timbunan di sisi yang lainnya. Dari kajian yang dilakukan, hakisan berlaku di Pantai Tok Jembal (Stesyen 1 hingga) dan timbunan berlaku di Pantai Teluk Ketapang (stesyen 7 hingga 9). Ini dibuktikan oleh taburan pasir dan bentuk profil pantai di Pantai Tok Jembal yang lebih kasar (nilai min: ≤ 1) dan curam (kecerunan pantai : $>10^\circ$) berbanding di Pantai Teluk Ketapang. Selain itu, dapat dilihat bahawa berlaku hakisan yang teruk di Pantai Tok Jembal terutama ketika monsun apabila jalanraya dan pokok-pokok yang terdapat di tepi pantai berkenaan rosak dan musnah.

CHAPTER 1

INTRODUCTION

Malaysia coastline, which is about 4809 km in length, has an abundance of natural biodiversity and rich in coastal resources. The coastal area supports a major percentage of the population (about 70%) and is the centre of socio-economic activities such as urbanization, agriculture, fisheries, aquaculture, oil and gas industry exploitation, transportation and communication, tourism and recreation. Many industries are also situated in the coastal cities to aid export and to utilize the labor pool in the urban centers.

However, rapid development activities in the coastal area have resulted in a conflict in the need for instant consumption and the need to guarantee the long-term supply of these resources. Thus, it has resulted in many problems such as increasing of erosion areas, siltation, loss of coastal resources and the devastation of the sensitive marine habitat. Concern is also growing, in specific about the destruction of natural ecosystem by the pressure placed upon by them by population and economic growth.

According to the National Coastal Erosion Study (1985) about 1300 km out of a total of 4809 km of coastline in Malaysia is facing erosion. Coastal erosion occurs when erosion rate is larger than deposition rate. Furthermore, beach erosion can be triggered by two main factors, which are human activities and natural occurrences. Several factors of human activities which contributed to beach erosion are destruction of mangrove trees,