

**A STUDY ON THE VARIATION OF BEACH EROSION AT BESUT
AND MARANG BEACHES, TERENGGANU, MALAYSIA**

SUNITA BINTI DAUD

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

2012

**A STUDY ON THE VARIATION OF BEACH EROSION AT BESUT AND MARANG
BEACHES, TERENGGANU, MALAYSIA**

By

Sunita Binti Daud

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

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

2012

This project report should be cited as:

Sunita, D. 2012. A study on the variation of beach erosion at Marang and Besut, Terengganu. Undergraduate thesis, Bachelor of Science In Marine Science, Faculty-Maritime Studies and Science Marine, Universiti Malaysia Terengganu. 112p.

No part of this project report may be reproduced by any mechanical, photographic, or electronic process, or in the form of phonographic recording, nor may it be stored in retrieval system, transmitted, or otherwise copied for public or private use, without written permission from the author and the supervisor(s) of the project.

1100088912

HP
A2
FYP
3
0812



**JABATAN SAINS MARIN
FAKULTI PENGAJIAN MARITIM DAN SAINS MARIN
UNIVERSITI MALAYSIA TERENGGANU**

**PENGAKUAN DAN PENGESAHAN LAPORAN
PROJEK PENYELIDIKAN I DAN II**

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: **A Study On The Variation Of Beach Erosion At Marang And Besut, Terengganu** oleh **Sunita Binti Daud**, No. matrik: **UK 19764** telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Marin sebagai memenuhi sebahagian daripada keperluan memperoleh Ijazah Sarjana Muda Sains (Sains Samudera), Fakulti Pengajian Maritim dan Sains Marin, Universiti Malaysia Terengganu.

Disahkan oleh:

.....PROF. MADYA DR. ROSNAN BIN YAACOB
Ketua
Jabatan Sains Marin
Fakulti Pengajian Maritim dan Sains Marin
Universiti Malaysia Terengganu
21030 Kuala Terengganu

Penyelia Utama

Nama :

Cop Rasmi :

Tarikh. 21/6/2012

.....
Ketua Jabatan Sains Marin
PROF. MADYA DR. ROSNAN BIN YAACOB
Ketua
Jabatan Sains Marin
Fakulti Pengajian Maritim dan Sains Marin
Universiti Malaysia Terengganu
21030 Kuala Terengganu

Nama :

Cop rasmi :

Tarikh. 21/6/2012

ACKNOWLEDGEMENT

First and foremost, my deepest gratitude goes to Allah S.W.T for his kindness that gives me strength and blesses to finish this final year project. Million thanks to my supervisor Assoc. Prof .Dr. Rosnan Yaacob for his guidance, concerned advises and constructive comments from the beginning of the research till the final submission of the thesis.

Special thanks to Mr. Effi, Miss Aisyah and Mr. Syaibul for their guidance, ideas, time and knowledge. Special thanks also dedicated to assistants of Oceanography Laboratory; Mr. Suliman, Mr. Raja, Mr. Sainol and Mr. Naim for their guidance and allowing me to use and borrow the laboratory equipment and apparatus during my lab and sampling work.

I also would like to express my thankful to Wawa, Yana, Maisarah, Ila, Asyikin, Zuhairi, Fairuz, Haziq, Khairul, Amir and Syafiq for their priceless assists during sampling work. My thanks also go to my beloved friends, Nisa, Anis, Dila, Kila, Ain, Melah for their continuous supports and encouragements from the beginning until the completion of this project.

Last but not least, my sincere gratitude to beloved family, especially Mak and Bapak and to all my friends whom are not mentioned here, for their continuous assistance and supports to do the best. This project will not be able to be completed without everyone help and support. Thank you.

TABLE OF CONTENTS

CONTENTS	PAGE
ACKNOWLEDGMENT	ii
LIST OF TABLES	v
LIST OF FIGURES	viii
LIST OF ABBREVIATIONS AND SYMBOLS	x
LIST OF APPENDICES	xi
ABSTRACT	xii
ABSTRACT	xiii
1.0 INTRODUCTION	
1.1 Preference	1
1.2 Objectives	3
1.3 Previous Study	3
1.4 Justification of study	4
2.0 LITERATURE REVIEW	
2.1 Beach	5
2.1.1 Types of Beach	6
2.1.2 Beach Profile	7
2.1.3 Beach Erosion	9
2.2 Sedimentology	11
2.2.1 Sediment Characteristic	12
2.2.2 Sediment Distribution	13
2.3 Physical process	14
2.3.1 Wave	15
2.3.2 Wind	16
2.3.2 Current	18
3.0 METHODOLOGY	
3.1 Study area	20
3.2 Physical Parameter Measurement	23
3.3 Beach Profile Measurement	23
3.4 Beach sediment Analysis	25
3.5 Dry Sieve Analysis	25
3.6 Sedimentological Calculation	26
4.0 RESULTS	
4.1 Physical parameter analysis	28

4.1.1	Rain Distribution	28
4.1.2	Wind	30
4.1.3	Tides	32
4.2	Beach Profile Data analysis	35
4.2.1	Beach Profile	35
4.2.2	Beach Slope	43
4.3	Sediment Characteristics	45
4.3.1	Mean	45
4.3.2	Sorting	48
4.3.3	Skewness	52
4.3.4	Kurtosis	56
4.4	Net Shore Drift (NSD)	60
4.4.1	Grain size Distribution	60
4.4.2	Beach Slope	61
5.0 DISCUSSION		
5.1	Beach Profile Analysis	63
5.2	Sediment Characteristic	68
5.2.1	Mean	68
5.2.2	Sorting	71
5.2.3	Skewness	73
6.0 CONCLUSION		88
7.0 REFERENCES		91
8.0 APPENDIX		99
9.0 CURRICULUM VITAE		102

LIST OF TABLES

TABLES	PAGE
2.1: Distribution of coastal areas affected by erosion in Malaysia (1985)	10
2.2: Distribution of coastal areas affected by erosion in Malaysia (1996)	11
3.1: The coordinate of sampling area at Besut	22
3.2: The coordinate of sampling area at Marang	22
4.1: Kuala Terengganu Rainfall Distribution from May 2011 until January 2012	29
4.2: Average of Kuala Terengganu Wind Speed from May 2011 until January 2012	31
4.3: Average of Tok Bali Tides level from May 2011 until January 2012	33
4.4: Average Chendering Tides level from May 2011 until January 2012	34
4.5.1: The Order of Beach Slope Degree of Besut in May 2011 until January 2012	44
4.5.2: The Order of Beach Slope Degree of Marang in May 2011 until January 2012	44
4.6: Average Mean data in May 2011 and January 2012 at Besut (Phi)	46
4.7: Average Mean data in May 2011 and January 2012 at Marang (Phi)	47
4.8: Average Sorting data in May 2011 and January 2012 at Besut (Phi)	50
4.9: Average Sorting data in May 2011 and January 2012 at Marang (Phi)	51
4.10: Average Skewness data in May 2011 and January 2012 at Besut (Phi)	54
4.11: Average Skewness Value in May 2011 and January 2012 at Marang (Phi)	55
4.12: Average Kurtosis data in May 2011 and January 2012 at Besut (Phi)	58
4.13: Average Kurtosis data in May 2011 and January 2012 at Marang (Phi)	59
4.14: Average of Mean and Sorting Value (Phi) at Mid Tide Level	60

4.15:	The Range of Beach Slope Degree of Besut and Marang	62
5.1:	The Average Value of Beach Slope Degree of Besut and Marang from May 2011 to January 2012	67
5.2:	Order of Besut and Marang Station According to Average of Mean Value at Mid Tide Area	78
5.3:	Order of Besut and Marang Station According to Average of Sorting Value at Mid Tide Area	79
5.4:	Order of Besut and Marang Station According to Average of Beach Slope Degree	80

LIST OF FIGURES

TABLES	PAGE
2.1: Current circulation pattern during Northeast monsoon at South China Sea	19
2.2: Current circulation pattern during Southwest monsoon at South China Sea	19
3.1: Map of sampling stations at Besut	21
3.2: Map of sampling stations at Marang	21
4.1: Summary of Kuala Terengganu Rainfall Distribution from May 2011 until January 2012	29
4.2: Average of Kuala Terengganu Wind Speed from May 2011 until January 2012	31
4.3: Average of Tok Bali Tides level from May 2011 until January 2012	33
4.4: Average of Chendering Tides level from May 2011 until January 2012	34
4.5.1: Beach Profile Changes of station 1 (Besut)	39
4.5.2: Beach Profile Changes of station 2 (Besut)	39
4.5.3: Beach Profile Changes of station 3 (Besut)	39
4.5.4: Beach Profile Changes of station 4 (Besut)	40
4.5.5: Beach Profile Changes of station 5 (Besut)	40
4.5.6: Beach Profile Changes of station 6 (Besut)	40
4.6.1: Beach Profile Changes of station 1 (Marang)	41
4.6.2: Beach Profile Changes of station 2 (Marang)	41
4.6.3: Beach Profile Changes of station 3 (Marang)	41
4.6.4: Beach Profile Changes of station 4 (Marang)	42
4.6.5: Beach Profile Changes of station 5 (Marang)	42
4.6.6: Beach Profile Changes of station 6 (Marang)	42

LIST OF SYMBOLS AND ABBREVIATIONS

List of Symbols

1. %	Percentage
2. Ø	Phi
3. Km	Kilometer
4. m	Meter
5. mm	Millimeter
6. µm	Micrometer
7. g	Gram
8. ms ⁻¹ or m/s	Meter per second
9. °	Degree
10. ‘	Minute
11. N	North
12. E	East

List of abbreviations

1. HT	High Tide (High level of Tide)
2. MT	Mid Tide (Middle level of Tide)
3. LT	Low Tide (Low level of Tide)
4. NSD	Net Shore Drift

ABSTRACT

Study on the variations of beach erosion at Besut and Marang Beaches was conducted to determine the changes of beach profile and the sediment characteristics at these particular areas. Sampling was conducted in six stations at Besut and Marang respectively and has been carried out in two times which is in May 2011 which represented before monsoon season and January 2012 which is during monsoon season. The beach morphology and sediment characteristics at East Coast Malaysia were greatly influenced by Northeast monsoon. From this study, it seems that during the monsoon not only erosion rate on the beaches occurred, but it is also dominated by deposition in certain areas. By comparing the beach slope degree of Besut and Marang from May 2011 to January 2012, Marang has higher beach slope degree than Besut such as at station 1, 2 and 3. Although, both Besut and Marang have a wavebreaker at the river mouth, however at Besut, there are series of groin was built at the shoreline. The rain distribution and wind velocity play a great role which influenced the changes of the sediment characteristics and beach profile changing. Moreover, the existence of man-made structure also has been caused a different effect to the beach morphology changes. From the study, the sediment in the both areas was dominated by coarser sand type and poorly sorted values. Most of the sample was distributed to very negatively skewed followed by negatively skewed sediment. Meanwhile, the distribution of sediment in the both study area was dominated by the medium sand type with poorly sorted and moderately sorted sediments. Based on this study, erosion process at Marang was most eroded compared to Besut. Sediment at Marang also coarser and poorly sorted compared to Besut.

ABSTRAK

Kajian mengenai variasi hakisan pantai di Pantai Besut dan Marang telah dijalankan untuk menentukan perubahan profil pantai dan ciri-ciri sedimen. Persampelan telah dijalankan yang mana sebanyak enam stesen di Besut dan Marang dan telah dijalankan dua kali iaitu pada bulan Mei 2011 yang mewakili sebelum musim monsun dan Januari 2012 iaitu semasa musim monsun. Morfologi pantai dan ciri-ciri sedimen di Pantai Timur Malaysia banyak dipengaruhi oleh Monsun Timur Laut. Daripada kajian ini, didapati semasa monsun bukan sahaja kadar hakisan mendominasi pantai, tetapi turut didominasi oleh pemendapan di kawasan tertentu. Dengan membandingkan tahap pantai cerun Besut dan Marang dari Mei 2011 hingga Januari 2012, Marang mempunyai pantai darjah cerun yang lebih tinggi daripada Besut seperti di stesen 1, 2 dan 3. Walaupun, Besut dan Marang mempunyai pemecah ombak di muara sungai, tetapi di Besut, terdapat groin dibina di tepi pantai. Taburan hujan dan halaju angin memainkan peranan besar yang mempengaruhi perubahan ciri-ciri sedimen dan profil pantai. Selain itu, kewujudan struktur buatan manusia juga telah menyebabkan kesan yang berbeza kepada perubahan morfologi pantai. Daripada kajian ini, sedimen di kedua-dua kawasan ini didominasi oleh jenis pasir kasar dan susunan yang tidak sekata. Kebanyakan sampel telah diedarkan daripada condong sangat negatif diikuti oleh sedimen yang negatif condong. Sementara itu, taburan sedimen di kawasan kedua-dua kajian telah didominasi oleh jenis pasir sederhana dengan sedimen susunan tidak sekata dan susunan sederhana. Keseluruhannya daripada kajian ini didapati Marang lebih terhakis berbanding Besut. Sediment daripada Marang juga lebih kasar dan mempunyai susunan yang lebih tidak sekata.