



THE PERCEPTIONS OF COMMUNITY AND PUBLIC
AGENCIES ON THE ISSUE OF COASTAL EROSION
IN SELANGOR

BY

AINAA NAWWARAH IBRAHIM

A thesis submitted in fulfilment of the requirement for the
degree of Master of Science (Built Environment)

Kulliyyah of Architecture and Environmental Design
International Islamic University Malaysia

AUGUST 2015

ABSTRACT

Malaysia is a maritime nation blessed with valuable coastlines. Therefore, it is important to preserve its precious coastal areas in a sustainable manner. However, coastal areas are continuously facing tremendous development pressures both from natural and anthropogenic factors. These include tsunami event, rapid urbanization process, the aquaculture sector, oil, and others. Consequently, these situations create problems to coastal areas. For instance, the issues of erosion and loss of habitats are significant in many maritime nations. Thus, this research was initiated to highlight the affecting coastal areas particularly, the problem of erosion. The research addressed the perspectives of community and public agencies on the issue of coastal erosion in Selangor. The coastline of Selangor was selected as it experienced erosion problem, due to continuous development activities. The objectives of the research were to comprehend the perception of the coastal community and public agencies in relation to the issue of coastal erosion in Selangor; to identify areas which are affected by coastal erosion in different categories; and to analyse the management method to address the issue of erosion in Selangor. Research methods applied was mainly by conducting questionnaire survey, which was distributed to a total of 377 coastal residents, as well as site-observation. Based on the data obtained from the Department of Drainage and Irrigation, Selangor was experiencing severe erosion problems at some stretches of its coastlines, which were considered as Category one (extremely dangerous). To be exact, Selangor coastline suffers from 63.5 kilometres stretch of category one erosion, 22.3 kilometres stretch of erosion in category two and 66.1km of erosion in category three. These areas involved 33 km of coastal areas. The areas are Bagan Beting, Sungai Besar, Bagan Sekinchan, Jeram and Sungai Sembilang. From the risk assessment, it shows that the mean wave and average sea level rise in Selangor was not that high. However, the geological form on the coastal area in Selangor consists of sensitive geological limestone and 'shale'. This structure is not strong and fragile and could not cope with the burden of development. Results from the survey questionnaire also indicated that the coastal erosion was significant in Selangor with 77% of the respondents agreed with that statement. In addition, 75% of them felt that their coastlines were considered as 'seriously affected'. As for the recommendations, soft approach and hard approach such as rock revetment, coastal revegetation, and enhancement of coastal policies and beach nourishment.

ملخص البحث

ماليزيا هي دولة بحرية المباركة مع الشواطئ التي لا تقدر بثمن. وبالتالي فإنه من المهم للحفاظ على المناطق الساحلية الثمينة بطريقة مستدامة. ومع ذلك، والمناطق الساحلية تواجه باستمرار الضغوط التطور الهائل كلا من العوامل الطبيعية والبشرية. وتشمل هذه الحدث تسونامي، وعملية التحضر السريع، قطاع تربية الأحياء المائية والنفط وغيرها. وبالتالي هذه المواقف تخلق مشاكل للمناطق الساحلية. على سبيل المثال، قضايا التعرية وفقدان الموائل الهامة في العديد من الدول البحرية. وهكذا، بدأ هذا البحث من قبل ظاهرة عالمية على المناطق الساحلية، وخاصة مشكلة تآكل. يتناول هذا البحث قضية تآكل السواحل واحدة من المشاكل الرئيسية الساحلية في ولاية سيلانجور. وقد تم اختيار سواحل ولاية سيلانجور كما شهدت مشكلة تآكل كبيرة نسبيا بسبب النمو التطوير المستمر. كانت أهداف البحث لفهم تصور المجتمع الساحلي فيما يتعلق بمسألة تآكل السواحل في ولاية سيلانجور. تحليل العوامل المسببة المساهمة في تآكل السواحل في ولاية سيلانجور. وتحليل القضايا شدة التعرية الساحلية في ولاية سيلانجور. وكانت وسائل البحوث التطبيقية أساسا عن طريق إجراء الاستبيان إلى ما مجموعه 377 سكان المناطق الساحلية ومراقبة الموقع. يوضح هذا التحليل أن سيلانجور تشهد حاليا مشاكل التآكل الشديد في بعض تمتد من السواحل، والتي كانت تعتبر التصنيف 1 (في غاية الخطورة). على وجه الدقة، سيلانجور الساحل يعاني من 63.5 كيلو مترا تمتد من فئة 1 التعرية، 22.3 كيلو مترا تمتد من تآكل في فئة 2 و 66.1 km تآكل في الفئة 3. وشملت هذه المناطق 33 كم من المناطق الساحلية. من بين المناطق هي Bagan Beting، سونغاي بيسار، Jeram، BaganSekinchan، وسونغاي Sembilang. From تقييم المخاطر، فإنه يدل على أن موجة متوسط ومتوسط ارتفاع مستوى سطح البحر في ولاية سيلانجور ليست عالية ولكن من حيث الشكل الجيولوجي في المنطقة الساحلية في ولاية سيلانجور لديه مثل هذا الحجر الجيري الجيولوجي حساسة و "الصخر الرقيق". هذه البنية ليست قوية وهشة، ولا يمكن مواجهة أعباء التنمية. وأشارت نتائج الاستبيان أيضا أن تآكل السواحل كان كبيرا في سيلانجور مع 77٪ من المشاركين وافقوا على هذا البيان. بالإضافة إلى ذلك، رأى 75٪ منهم أن سواحلها واعتبرت أنها "أثرت بشكل خطير". عموما، نجح هذا البحث لتحقيق أهدافها المحددة.

APPROVAL PAGE

I certify that I have supervised and read this study and that in my opinion, it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a thesis for the degree of Master of Science (Built Environment)

.....
M. Zainora Asmawi
Supervisor

.....
Norzailawati Mohd Noor
Co-Supervisor

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a thesis for the degree of Master of Science (Built Environment)

.....
Mansor Ibrahim
Internal Examiner

.....
Rafee Majid
External Examiner

This thesis was submitted to the Department of Urban and Regional Planning and is accepted as a fulfilment of the requirement for the degree of Master of Science (Built Environment)

.....
Norzailawati Mohd Noor
Head, Department of Urban and
Regional Planning

This thesis was submitted to the Kulliyyah of Architecture and Environmental Design and is accepted as a fulfilment of the requirement for the degree of Master of Science (Built Environment)

.....
Alias Abdullah
Dean, Kulliyyah of Architecture
and Environmental Design

DECLARATION

I hereby declare that this thesis is the result of my own investigation, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

Ainaa Nawwarah Ibrahim

Signature.....

Date

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

**DECLARATION OF COPYRIGHT AND AFFIRMATION
OF FAIR USE OF UNPUBLISHED RESEARCH**

Copyright ©2015 by International Islamic University Malaysia. All rights reserved.

**THE PERCEPTIONS OF COMMUNITY AND PUBLIC AGENCIES ON THE
ISSUE OF COASTAL EROSION IN SELANGOR**

No part of this unpublished research may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without prior written permission of the copyright holder except as provided below.

1. Any material contained in or derived from this unpublished research may be used by others in their writing with due acknowledgement.
2. IIUM or its library will have the right to make and transmit copies (print or electronic) for institutional and academic purposes.
3. The IIUM library will have the right to make, store in a retrieval system and supply copies of this unpublished research if requested by other universities and research libraries.

Affirmed by Ainaa Nawwarah

.....
Signature

.....
Date

ACKNOWLEDGEMENTS

I am grateful to Allah the Almighty for His guidance and blessings throughout this research.

*To Mummy
Who always picked me up on time
And encouraged me to go on every adventure
Especially this one
And
To my wonderful friends, of course!*

Special thank goes to my helpful supervisor, Assoc. Prof. Dr. M. Zainora Asmawi and Asst. Prof. Norzailawati Mohd Nor for their endless support, guidance, encouragement and comments throughout this research and also throughout my study. The supervision and support that they gave truly help the progression and smoothness of my research. The co-operation is much indeed appreciated.

A deep bow goes to all the lecturers of KAED who have directly or indirectly giving guidance and support throughout my study in KAED. May Allah continue to protect, bless and guide all of you.

My sincere gratitude goes to my wonderful family members for their never ending support during the course of my studies.

Not forgetting, special thanks to all my colleagues for endless support, motivation and guidance throughout the whole course. My second family, you guys know who you are #133. Thanks guys!

Last but not least I would like to thank my other half, Aisyah Nadhrah for the sleepless nights, endless patience, tolerance, kindness and support throughout my entire course of study. Thanks SYA!

-Ainaa Nawwarah Ibrahim (March 2015)-.

TABLE OF CONTENTS

Abstract	ii
Abstract in Arabic.....	iii
Approval page	iv
Declaration	v
Copyright Page.....	vi
Acknowledgements	vii
List of Tables.....	xi
List of Figures	xii
CHAPTER 1: INTRODUCTION	1
1.1 Introduction	1
1.2 Background	2
1.3 Problem Statement	4
1.3.1 Uncontrolled Human Intervention and Coastal Development	4
1.3.2 Natural Processes	6
1.4 Research Questions	7
1.5 Goal and Objectives	8
1.6 Scope of Study	8
1.7 Study Limitation	9
1.8 Significance of Study	10
1.9 Thesis Structure	11
1.10 Conclusion.....	12
CHAPTER 2: LITERATURE REVIEW.....	14
2.1 Introduction	14
2.2 Coastal Zone.....	14
2.2.1 Coastal Zone in Malaysia	16
2.3 Coastal Erosion.....	18
2.3.1 Factor Contributing to Coastal Erosion	20
2.3.1.1 Man-made	21
2.3.1.2 Natural	23
2.3.2 Coastal Erosion in Malaysia.....	24
2.3.3 Causes of Coastal Erosion in Malaysia	28
2.4 Managing Coastal Erosion	33
2.4.1 Hard and Structure/ Engineering Options.....	34
2.4.1.1 Offshore breakwater.....	34
2.4.1.2 Beach Nourishment.....	36
2.4.1.3 Coastal Revegetation.....	36
2.4.1.4 Coastal Protection Policies and Guidelines	37
2.4.1.5 Shoreline management plans and erosion control	40
2.4.1.6 Coastal erosion risk assessment (CERA)	41
2.5 Conclusion	44

CHAPTER 3: RESEARCH METHODOLOGY	45
3.1 Introduction	45
3.2 Study Stages	45
3.3 Study Methodology	46
3.3.1 Stage One: Preliminary Study and Literature Review	46
3.3.1.1 Research Problem Statement	46
3.3.1.2 Literature Review	46
3.3.2 Stage Two: Data Collection	47
3.3.2.1 Primary Data	47
3.3.2.2 Secondary Data.....	51
3.3.3 Analysis	51
3.3.3.1 Instrumentation of Analysis	52
3.3.4 Stage Four: Recommendation and Conclusion	55
3.4 Comments on Research Methods	55
3.5 Conclusion.....	55
CHAPTER 4: STUDY AREA	57
4.1 Introduction	57
4.2 Coastal Zone in Malaysia.....	57
4.2.1 Types of Coast in Malaysia.....	59
4.2.2 Socio-Economic Framework on Coastal Zone in Malaysia.....	61
4.2.3 Coastal Management in Peninsular Malaysia	62
4.3 Background of Study Area.....	63
4.3.1 Profile of Selangor State	63
4.4 Coastal Zone of Selangor.....	65
4.5 Significance of Site Selection.....	71
4.6 Conclusion.....	71
CHAPTER 5: DISCUSSIONS OF FINDINGS	72
5.1 Introduction	72
5.2 Analysis on Coastal Erosion Aspect in Selangor	73
5.2.1 Current condition of coastal area in Selangor	73
5.3 Coastal Erosion Risk Assessment	87
5.3.1 Geological Structure.....	88
5.3.2 Coastal Slope	89
5.3.3 Density of Development	89
5.4 Analysis on Community's Perception on Coastal Erosion Issue in Selangor	90
5.4.1 Respondent Profile.....	90
5.4.2 Factors Contributing to Coastal Erosion Selangor	95
5.4.3 Activities Leads to Coastal Erosion in Selangor	98
5.4.4 Correlation Analysis.....	102
5.5 Analysis on Public Agencies Perception on Coastal Erosion Issues in Selangor	104
5.5.1 Respondent Profile.....	104
5.5.2 Coastal Erosion Issue in Selangor	108
5.5.3 Factors Contributing to Coastal Erosion Selangor	109

5.5.4 Activities Leads to Coastal Erosion in Selangor	111
5.5.5 Department Involvement on Coastal Erosion Issues	113
5.5.5 Correlation Analysis.....	116
5.6 Analysis on Management Aspect	117
5.7 Summary of Findings	118
5.8 Conclusion.....	119

CHAPTER 6: SUMMARY, RECOMMENDATIONS AND CONCLUSION ..120

6.1 Introduction	120
6.2 Summary of the Research	120
6.3 Recommendations	121
6.3.1 Scenario One: Soft Approach.....	122
6.3.2 Scenario Two: Hard Approach.....	126
6.4 Research Gaps on Coastal Issues in Malaysia.....	131
6.5 Conclusion.....	133

REFERENCES134

APPENDIX I: QUESTIONNAIRE ON COMMUNITY.....	141
APPENDIX II: QUESTIONNAIRE ON PUBLIC AGENCIES.....	150

LIST OF TABLES

<u>Table No.</u>		<u>Page No.</u>
1.1	Dependent and Independent Variables	10
2.2	Types of coastal erosion	20
2.3	Categories of coastal erosion	27
2.4	Eroding shorelines in Malaysia	28
2.5	Studies related to coastal management	42
3.1	Questionnaire Survey Respondents Sampling	52
3.2	Relative Important Index table	57
3.3	Coastal Erosion Risk Assessment Table	58
4.1	Eroded Coastal Length Based on State in Malaysia	61
4.2	Population Based on State in Malaysia	64
4.3	Coastal District in Selangor	67
5.1	Coastal Erosion in Selangor	88
5.2	Coastal Erosion Risk Assessment	93
5.3	Respondents Age Group	97
5.4	Level of Education	98
5.5	Place of Living	99
5.6	Years of Residency	99
5.7	Factors Contributing to Coastal Erosion in Selangor	103
5.8	Activities Leads to Coastal Erosion in Selangor	104
5.9	Human Intervention time scale on coastal erosion	108
5.10	Relationship between community's opinion on factors contributing to coastal erosion in Selangor	109

5.11	Respondents Age Group	112
5.12	Level of Education	113
5.13	Years of Experience	114
5.14	Area of Specialization	115
5.15	Factors Contributing to Coastal Erosion in Selangor	117
5.16	Activities Leads to Coastal Erosion in Selangor	119
5.17	Departments Involve in Coastal Erosion Issue	122
5.18	Relationship between public agencies opinion on factors contributing to coastal erosion in Selangor	124
6.1	Physical Tools for Managing Coastal Erosion	140
6.2	Research Gaps on Coastal Management in Malaysia	141

LIST OF FIGURES

<u>Figure No.</u>		<u>Page No.</u>
2.1	Cross-section on coastal area	16
2.2	Factors contributing to coastal erosion	22
2.3	Coastal wave climate	25
2.4	Critical (Category 1) erosion areas in Peninsular Malaysia	29
2.5	Environmental Sensitive Area in Peninsular Malaysia	34
2.6	Examples of offshore breakwater	37
2.7	Example of offshore breakwater	37
2.8	Policies related to coastal erosion	39
3.1	Methodology Flow Chart	60
4.1	Map of Selangor State Location in Malaysia	61
4.2	Example of Sandy Beaches in Selangor	62
4.3	Example of Sandy Beaches in Selangor	62
4.4	Key plan and location plan of Selangor	66
4.5	Planning units in Selangor coastal zone	74
5.1	Coastal Districts in Selangor	78
5.2	Some of Coastal Protection Wall that has been damaged in Pantai Remis	79
5.3	Existing condition in Kuala Selangor area	80
5.4	Offshore Breakwater in Pantai Sepang	81
5.5	Existing condition in Sepang area	82

5.6	Existing Condition in Sabak Bernam Area	84
5.7	Existing Condition in Kuala Langat Area	84
5.8	Existing Condition in Klang Area	87
5.9	Coastal Erosion Based on Category	91
5.10	Gender of Respondents	97
5.11	Coastal Erosion Issue in Selangor	100
5.12	Severity Level of Coastal Erosion in Selangor	101
5.13	Gender of Respondents	115
5.14	Coastal Erosion Issue in Selangor	116
5.15	Severity Level of Coastal Erosion in Selangor	126
5.16	Coastal erosion management in Selangor	126
6.1	Soft Approach diagram	131
6.2	Hard Approach diagram	135
6.3	Rock revetment in coastal area in Sepang	137
6.4	Rock revetment in coastal area in Pantai Morib and Port Klang	137
6.5	Existing and Proposed Physical Structures	138

LIST OF MAPS

<u>Map No.</u>		<u>Page No.</u>
4.1	Site Plan	105
4.2	Selangor road network system	109
4.3	Coastal boundary for Selangor Planning Unit 1	111
4.4	Coastal boundary for Selangor Planning Unit 2	112
4.5	Coastal boundary for Selangor Planning Unit 3	113
4.6	Current Condition on Coastal Area in Selangor	118

CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

Coastal environment profile consists of physical setting and land use, natural resources and environment, tourism, fisheries and aquaculture, shipping and other socio-economic activities. All these activity are normally conducted on an area, which is called coastal zone. Normally coastal zone were dominated by a large percentage of the population in a certain area (Ragenbogen, 2014). This is due to its function as the centre of economic activities, which include agriculture, oil and gas exploitation, urbanization, transportation and communication. Today, with the status of developing country, most of the coastal zones has been damage and disrupt due all these development from various sectors take place.

Managing coastal zone is not a simple task. The main issue that is closely related to coastal management includes the loss of biodiversity and habitat due to the stress caused by the human intervention. This pressure can drag up to 50 years' time. As a result of extensive development either from a land-based or marine-based can leads to physical destruction and pollution of habitats. UNEP (2004) highlighted one of the examples that are the clearance of mangrove for local consumption and export. Besides, land clearance for agriculture and fuel wood can lead to siltation that threaten the marine life.

Coastal erosion, on the other hand, is a natural process which occur due to wave and wind, but, human interference cause the issue to get worse.

In Malaysia, port development and tourism development which is closely related to coastal engineering has been identified as the main cause that contribute to erosion (Ueda, 2001). In addition to that, the world is facing a global warming issue which leads to sea level rise and as a consequence, coastal erosion and flooding in coastal lowlands are likely to increase (IPCC, 2001).

Normally, the disastrous flash flood which caused by tsunamis or climate-driven marine surge, can be solved through the most cost-effective method which is planned relocation.

Coastal erosion is a natural and slow process, human intervention usually cause this phenomenon to accelerate rapidly. Coastal protection such as rock revetment or bund revetment will only protect the area behind it. But if the wave continues to diffract or spread, eventually, erosion will occur. This phenomenon can be seen the Buntu and Rimba Terjun areas, where the erosion down coast of the completed revetment became more severe after the completion of the revetment.

Therefore, this research identifies the perception for both the community living in the coastal area and also the public agencies which are responsible for the coastal area in Selangor on the issue of coastal erosion in Selangor.

1.2 BACKGROUND

Urban areas or recreational areas suffer the most severe level of erosion worldwide. One of the reason is due to the structure of the coast which is a sandy beach. While there is more information available on coastal engineering in sandy shores, the theory regarding the erosion and suspension of cleave material under waves and current action is not well developed.

Theoretically, the coastlines are developed based on natural phenomena such as coastal erosion and accretion. As for undeveloped or natural shoreline area, coastal erosion is not a big issue. While for developed coastal area, this issue of erosion is very critical because it involves a destruction or damage to properties, infrastructures, and tourism. Understanding of the factors, which brings to the issue of coastal erosion will be a very big information in order to propose a successful erosion management plan which will solve the issue of erosion. It is important to consider local necessities that is to involve all the parties that are related to this area together with strategic principles which is the long-term perspective and working with natural processes.

All these issues of coastal erosion, degradation and pollution can be controlled through a sustainable coastal management even though the coastal development continues to promote industrial and recreational activities. It is true that, coastal development has often resulted in degradation and environmental ramifications, especially in developing countries where coastal areas are being used for urban development and industrialization without or with little attention paid to environmental problems (Roslan Kamali and Ahmad Mustafa Hashim, 2010).

It has always been a combat between the resource managers and the policy makers in Malaysia in order to come out with a plan which will balance out between development on coastal area and preservation of coastal resources (Mohd Nizam Basiron, 1995).

Nowadays, there are various ways or mitigation measures that have been developed in order to overcome this issue. This issue also has led to major efforts to manage coastal erosion problems and to restore coastal capacity to accommodate short- and long-term (Prasetya, 2008), changes induced by human activities, extreme events and sea level rise.

For example, through engineering measures such as groins, detached breakwaters, revetments, and seawalls. In addition, Coastal Erosion Risk Assessment (CERA), Geographical Information Systems (GIS) and Remote Sensing (RS) considerably support managerial decision-making process to manage spatial information, which include aerial photographs and coastal topographic maps (Bartoletti et al., 1995; Özhan&Vefai, 1991; Hassan & Baset, 1997).

1.3 PROBLEM STATEMENT

In Malaysia, coastal erosion has affected approximately 151.9 kilometres stretch of coastal length in Selangor. This shows how serious the issue of coastal erosion has become. Below are two main problems that lead to further research on this issue.

1.3.1 Uncontrolled Human Intervention and Coastal Development

Coastal area, which is the area between the land and the sea, has been a very important role throughout the years. It has a major role as human settlements and productive agriculture. Therefore, the impact on coastal areas are expected to get worse in the future.

The issue of coastal erosion has been a highlighted issue nowadays, therefore, so many major efforts were being undertaken in order to manage the erosion problems and also to restore coastal capacity in order to accommodate the short-term and long-term changes which are most likely to be caused by human intervention.

There has been action undertaken to combat this issue such as implementation of soft approach and also hard structures but, these method has not been implemented properly in terms of the design and even, it is not maintained properly which brings the effects on the adjacent shores. Often erosion is addressed locally at specific places

or at regional or jurisdictional boundaries instead of at system boundaries that reflect natural processes. This anomaly is mostly attributable to insufficient knowledge of coastal processes and the protective function of coastal systems (FAO, 1998).

On the local context, 1300km out of 4300km shorelines in Malaysia has been affected by coastal erosion. The National Coastal Erosion Study 1986 reported that area such as Tanjung Piai in Johor Bahru continues to be threatened by this issue (National Academy Press, 1990). The erosion caused by the large waves created by an increasing number of ships utilizing the Straits of Malacca and the Port of Tanjung Pelepas, and is most prevalent in areas of the Sungai Pulai estuary.

Coastal zone can be categorized as fragile. This area is very vulnerable especially on the physical aspect. This phenomenon can be seen through the series of events of coastal erosion and another associated loss of land. The effect will not only threaten the biodiversity and nature, but also to human especially to human settlements, harbours, coastal recreation areas, wetlands and marshes. On top of that, the impacts are expected to increase as a consequence of climate change.

On the other hand on the regional context, there are some issues related to coastal erosion recorded. For instance, in Indonesia, coastal erosion started in the northern coast of Java Island in the 1970s when most of the mangrove forest had been converted to shrimp ponds and other aquaculture activities, and the area was also subjected to unmanaged coastal development, diversion of upland freshwater and river damming (Prasetya, 2008).

The issue of erosion is very common especially in Lampung, Northeast Sumatra, Kalimantan, West Sumatra (Padang), Nusa Tenggara, Papua, South Sulawesi and Bali (Bird and Ongkosongo, 1980; Syamsudin *et al.*, 2000; Tjardana, 1995; Prasetya and Black, 2003 ; Nurkin, 1994). Indonesian Government has spent as

much as US\$79.667 million in order to overcome this issue, which took place from 1996 to 2004. But, among all of these places, only Bali Island still continues to promote the tourism industry.

Soft approach and hard approach are being considered. For example engineering approaches (breakwaters/jetties/revetments) of different shapes that fused functional design and aesthetic values, and soft structures and engineering approaches (beach nourishment) was used. But, although it solve the problems, during low tide all of the coastal area was exposed up to 300 metres offshore; thus, these huge structures were revealed and became eyesores.

1.3.2 Natural Processes

Coastal erosion is caused by mostly human interventions but it is also a natural processes that occur on coastal area. The example is, waves are higher in the east coast of Peninsular Malaysia due to the longer fetch-lengths of the South China Sea. The west coast is a more protected environment with fetch-lengths limited by the presence of Sumatera. Though wave heights are smaller here, more erosion incidents occur here as compared to the east coast. On the west coast, the erosion threat is not only due to the waves of the south-west monsoon (May to September) but also due to those brought about by squall known as the Sumatera which occur throughout the year.

Throughout the years, the total area of mangrove forest continues to degrade which indirectly cause exposure of a very large stretches of coastal area to direct wave attack. These can be observed along the coastlines of Selangor (Kuala Selangor to Sabak Bernam), Perak (Bagan Datoh) and Johor (Muar to Tg. Piai). Most of the totally exposed stretches have already been protected with revetments. A major

problem in these low-lying agricultural areas is the poor geotechnical properties of the soil. The first 2-metres of soil on the mud beaches along the Selangor and Perak coasts have undrained shear strengths in the range of 5 kN/m² to 10 kN/m². The weak soils also lead to the subsidence of bunds thereby increasing their risk of overtopping. With this constraint on bund crest heights, even short-duration storms which coincide with spring tides become a major concern. During the spring tide, water levels along the shoreline at Rungkup, Bagan Datoh in Perak can reach bund crest levels (estimated at about +2.8 to 3.0 metres LSD) and overtopping incidents have occurred whenever there are accompanying winds blowing shoreward especially along stretches where bund settlement have occurred. The major spring tide which occurs annually in or around October with tidal levels of +3.0 metres LSD has been the cause of numerous overtopping incidents over the years. Over the last decade, this region has experienced the most cases of bund overtopping and erosion leading to the construction of many emergency protection schemes.

This indicates that both inappropriate human intervention and natural processes will cause coastal erosion to occur. In line with that, this thesis tries to further assist in solving the issue of erosion by analysing the perspective of two different groups which are the local community and the public agencies in terms of their awareness of coastal erosion issue in Selangor.

1.4 RESEARCH QUESTIONS

There are four main research questions being highlighted in this study. They are as below.

- i. Which area along the Selangor coastline are seriously affected by coastal erosion?

- ii. How does the local community view the issue of coastal erosion in Selangor?
- iii. How does the public agencies view the issue of coastal erosion in Selangor?
- iv. What are suitable recommendations for effective coastal erosion management?

1.5 GOAL AND OBJECTIVES

The goal for this research is to analyse the relationship between the public agencies perspective and the local community perspective on the coastal erosion issue in Selangor. In order to achieve the above goal, there are four objectives that have been identified. They are as follows.

- i. To identify areas affected by coastal erosion in Selangor.
- ii. To analyse the coastal erosion issue from the local community perspective.
- iii. To analyse the public agencies perspectives on coastal erosion in Selangor.
- iv. To suggest suitable recommendations for effective coastal erosion management.

1.6 SCOPE OF STUDY

This study has been divided into three main scopes in order to ensure all aspects are covered. The three main scope of analysis that will be covered throughout this study are as follows. The existing condition of coastal area in Selangor, which include all the five coastal districts. The next two scopes covers on the perspective aspects which

include the causal factors, activities contributed to this issue and the severity level of erosion in this area, the management level and effective management measures but all these will be analysed based on the local community perspective and the public agencies perspective. In order to further support the analysis of this study, coastal erosion risk assessment analysis was being produced. This analysis will further prove on the natural processes part. For example, the shoreline type, geomorphology of the coast, the density of development, topography and also the wind and wave exposure.

Table 1.1
Dependent and Independent Variables

SCOPE	DEPENDENT VARIABLES
Existing Condition	1. Identification of Areas affected by coastal erosion base on the category.
Community Perception	<ol style="list-style-type: none"> 1. Existing coastal erosion issue 2. Severity level 3. Factors contributing to coastal erosion 4. Activities lead to coastal erosion in Selangor 5. Responsible bodies responsible for this issue 6. Management level 7. Effective coastal management recommendations
Public Agencies Perception	<ol style="list-style-type: none"> 1. Existing coastal erosion issue 2. Severity level 3. Factors contributing to coastal erosion 4. Activities lead to coastal erosion in Selangor 5. Responsible bodies responsible for this issue 6. Management level 7. Effective coastal management recommendations