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

BY

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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، سيلانغور الساحل يعاني من **63.5** كيلو مترا تمتد من فئة **1** التعرية، **22.3** كيلو مترا تمتد من تآكل في فئة **2** و**km66.1** تآكل في الفئة **3**. وشملت هذه المناطق **33** كم من المناطق الساحلية. من بين المناطق هي **Bagan Beting**، سونغاي بيسار، **BaganSekinchan**، **Jeram** 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 الزيتي". هذه البنية ليست قوية وهشة، ولا يمكن مواجهة أعباء التنمية. وأشارت نتائج الاستبيان أيضا أن تآكل السواحل كان كبيرا في سيلانغور 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)

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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 ….....

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Signature Date

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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
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-Ainaa Nawwarah Ibrahim (March 2015)-.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

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 develop 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 involve 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 issue of coastal erosion, degradation and pollution can control 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 has 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	**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	**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