A CASE STUDY ON FLOODS AT RANTAU PANJANG, KELANTAN

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ABSTRACT

The title of this study is A Case Study on Floods of 2010 and 2011 in Kelantan, Malaysia. This study focuses on causes and impacts of the floods occurred to the people, government and also nation. There are two main objectives of this study, which are firstly is to analyzed the floods occurred on November 2010 till January 2011 and secondly is to study the flood hazard management in Malaysia. To complete this study, a few of the interviewed with the Engineer from Drainage and Irrigation Department of Malaysia need to be done. The obtained data will be analyzed to find the main cause of the floods occurred. By comparing with previous study, the flood hazard management in Malaysia will be advanced in order to control the floods occurred and for the better life in future.

ABSTRAK

Tajuk kajian ini adalah " Kajian Kes Banjir 2010 dan 2011 di Kelantan, Malaysia". Kajian ini memberi tumpuan kepada punca-punca dan kesan banjir yang berlaku terhadap kerajaan, rakyat, dan juga negara. Terdapat dua objektif utama di dalam kajian ini, yang pertama adalah untuk menganalisis kejadian banjir yang berlaku pada November 2010 hingga Januari 2011 dan kedua ialah untuk mengkaji pengurusan banjir yang berlaku di Malaysia. Untuk melengkapkan kajian ini, beberapa sesi temubual dengan Jurutera dari Jabatan Pengairan dan Saliran Malaysia perlu dilakukan. Data yang diperolehi akan dianalisis untuk mencari sebab utama banjir berlaku. Dengan membandingkan kajian ini dengan kajian sebelumnya, pengurusan banjir yang berlaku di Malaysia akan lebih jitu untuk mengawal banjir daripada berlaku dan supaya kita dapat menjalani kehidupan yang lebih baik pada masa akan datang.

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CHAPTER 1

INTRODUCTION

1.1 Background of the study

Malaysia is situated in Southeast Asia and consists of Peninsular Malaysia from the Asia continents and Sabah and Sarawak in Borneo Island. Located near the equator with higher concentration of solar energy where the Sun's rays strike almost full on all year round and surrounded by the sea, the air is moist and is generally covered with clouds all year round.

Malaysia is highly influence by the dry and wet monsoons and also the period in between known as the inter-monsoon. The wet monsoon brings heavy, widespread continuous rains while the inter monsoon period usually produce high intensities convectional rains. The combination of the extremes temperature in equatorial regions with the pressure gradients in these areas and the maritime exposure produces extreme weather conditions and the frequent occurrence of floods. There are 189 river systems in the country (89

in Peninsular Malaysia; 78 in Sabah and 22 in Sarawak) flowing directly to the sea of which 85 are prone to frequent flooding. (JPS Manual, Vol.1, 2009)

Because of the increasingly of the rapid development and the unplanned urbanization process, will result in some area terrain changes and causing an undesirable natural disasters such as floods. Each year Malaysia has never been spared from flooding especially the states in the East Coast including Kelantan. Due to its geographical location, it is exposed to the North-East Monsoon from November to March every year. The Monsoon has invariably brought heavy rainfall over prolonged period, causing an almost annual recurrence of flood to the state in between the end of November till early January (JPS, 2006).

Floods often cause huge losses, both to individuals and the nation. Every year, Malaysian government is losing millions of dollars. As we all know that floods can cause a lot of damage to the buildings, contamination of food and beverages, loss of property and life, and also disruption of socio-economic activities such as transport and communication. To avoid flooding problems from recurring, the awareness of a systematic development plan and a suitable design of drainage system must be inculcated among the developers and engineers. In addition, a detailed analysis and studies must be done to ensure that drainage systems can be managed properly in order to prevent floods from occurred.

1.2 Problem statement

Flooding caused by many factors either naturally or due to human activities. Among these factors is the impact of uncontrolled development, land use without control, drainage problems and so on. Continuous heavy rain could cause flooding if the catchment area like a river cannot cope with excessive quantities of water. Among the flood control methods that have been proposed by the Department of Kelantan Drainage and Irrigation (JPS) is the project retaining Kelantan river bank erosion, deepening the river, build embankments and drainage upgrades. In conclusion, the flood that occurred has opened the eyes of many people to this problem. Estimation of surface runoff and flow rates of Kelantan river is important for flood forecasting in the near future. Hopefully, the methods of flood control and storm water management of the most effective and economically feasible for the common good.

1.3 Objectives

a) To study the flood based on precipitation recorded in the study area.
b) To analyze the flood hazard management at Rantau Panjang area.

1.4 Scope of Study

a) A visit to the area under

For more information on research and to identify the characteristics of the study area, a visit to the flood areas had been done.

b) Data acquisition

The necessary data such as flushing and flow rate data for the study area obtained from (JPS).

c) Data analysis using the obtained result.

Obtained data will be analyzed to get the result of this study.

d) Summarizing the results and discuss the results obtained before making any conclusions.

CHAPTER 2

LITERATURE REVIEW

2.1 Flood

Flooding is one of the natural disasters that often occurs in most place in the world including Malaysia itself. In Malaysia, an often flooded area is mainly on a low lying are and particularly in peninsular Malaysia. Most flood usually occurs in monsoon season which is between November to early March.

2.2 Flood Definition

An overflow or inundation that comes from a river or other body of water and causes or threatens damage. Any relatively high stream flow overtopping the natural or artificial banks in any reach of a stream.

2.3 Types of Flood

The flooding that occurred in Malaysia can be categorized into three types. Those categories were determined by the duration and intensity of rainfall and damage caused by the flooding.

2.3.1 Flash Flood

In Malaysia, the risk of human exposure to dangerous flash floods, especially in large cities with dense population distribution and the high rate of construction has increased significantly in recent years. This is evidenced by the occurrence of serious flash floods around the country's main cities such as Kuala Lumpur, Georgetown, Ipoh, Kota Bharu and others (Chan Ngai Weng , 1996).

Typically, flash floods occurred rapidly (a few minutes to half an hour after the rain event), but also ended quickly (term life is the half-hour to day). Among the causes of flash floods are:

1. Lack of catchment areas with impermeable surfaces.
2. Increase the size of the paved and cemented.
3. Improper flow caused by a clogged drain debris or obstacles.
4. The capacity of sewers and drains are not big enough in size to accommodate the surface runoff.

2.3.2 Flood dam

Flood dams are extremely rare in our country for all dams which is designed to take into consideration the excess water. Failure and mistakes people in the design of the dam was the source of flooding this. The destruction of the dam floods are the worst because usually dam structure built at the upper (upstream) and when this structure failure, all areas of the lower (downstream) will receive its effect.

2.3.3 Flood Area

Flood area covers a rather wide area and take a longer to subside than the flash flood. These floods occur as a result of Existing drainage unable to accommodate the excess flushing water run-off. This coupled with low infiltration rates due to factors land use change as a result of development. Flood areas are often caused disasters, loss of property and sometimes can lead to loss of life.

2.4 Factors of Flood Occur

Flooding is usually caused by several factors. Between these factors are:

1. Heavy rainfall.
2. The process of urbanization.
3. Erosion of the river.
4. Deforestation.
5. Unplanned drainage system

2.4.1 Heavy rainfall

Continuous rain will cause flooding in low-lying areas, particularly near the river or lake. This is because, due to the low areas, rain water will be discharged into rivers or lakes. When water is plentiful and overflowing the banks of the river, low-lying areas will be filled with water and flooding will occur.

2.4.2 The process of urbanization

Urbanization process that is more frequently carried out in our country, causes a lot of low-lying areas were reclaimed and many rivers and lakes to be buried deep in order o build a building. These activities often causing flash floods. When rainfall occurs, and water from the hills down to the bottom, the water will stagnate due to no drainage or river to drain the water.

2.4.3 Erosion of the river

In nature, river erosion occurs when it rains heavily. The water will be flowed fast and erode the banks of the river. Then, the land bank will collapse and form a sediment at the bottom of the river. So, the river will be shallower. When heavy rain falls, the river has become shallow, cannot be accommodate the storm water drain that much. Eventually the river will overflow their banks and flood will occur.

2.4.4 Deforestation

Forest is an area that accommodates a variety of plants and animals. Forests absorb rain water to the surface. Then the absorbed water will flow to the young trees by the roots. There is also the condensation process is done by releasing the water droplets into the air. So, natural water cycle will occur.

The forest destruction will cause the rain to flow to the land without been absorbed by the plant. So, the heavy rain will straightly flowing to the river. When the water flooded the river, flooding will occur.

2.4.5 Unplanned drainage system

Flooding problems that often occur in urban areas is due to the lack of irrigation or drainage system was built and maybe because it is too small or shallow. Total rainfall amounts can cause water to overflow out of the drainage system and cause flooding to occur.

2.5 Flood control and management

There are many ways managing the floods .which are :

1. Afforestation , which is planting the trees to increases interception rates and reduces surface runoff.
2. Dams and Reservoirs are used to hold back and regulate the flow of river water. Dams and reservoirs also can be used as fresh water supply.
3. The process of deepening the river to dig all the mud, dirt and debris found

in the river. When this process is done, the river will not only be getting in, but could drain some amount of rainfall.

4. Artificial Levees which is making river banks higher therefore holding more water.

5. Control the human activities to create awareness to the community that the negative activities such as garbage and industrial waste into the rivers can be forbidden.

2.6 Damage caused by flooding

Flooding caused a lot of damage to the human. Which are :

1. Loss of life
2. Destruction of property
3. Crop damage
4. The disease
5. Government losses

2.6.1 Loss of life

Flooding can also result in loss of life, especially in the low-lying area and close to the river. Most of those who lost their lives caused of flooding was children.

2.6.2 Destruction of property

Heavy flood can sink house, residential and take away the house. Moreover, the flood can give damage to other goods such as electrical goods, cars and so on. This brings a great loss to the people.

2.6.3 Crop damage

Floodwater stagnant for too long in the area of agriculture cause dead plant. Among the plant, the easiest to dead was a simple plant rubber, cocoa, palm oil and paddy. The destruction of these crops will adversely affect the farmers.

2.6.4 The disease

A serious damage that happen to human caused by the flood was the disease that will affect human after the flood. This is because, when flooding occur, there are a lot of disease that is coming flowing with the flood which are cholera and malaria due to the dirty water.

2.6.5 Government losses

Flooding often vandalism such as roads, buildings, telephone, electricity and cause many diseases. All this will be borne by the government to improve and fund medical equipment for the damage. All these require high maintenance costs. In addition, the government also have to provide basic needs such as food and beverages, medicines and providing a temporary settlement of flood victims.

2.7 Rain

Rain is the water drops down from the atmosphere through the process of flushing in the hydrological cycle. Some of it flows in the form of runoff surface into lakes, rivers or the sea, while the rest evaporates and the other part was re-infiltrate into the soil and formed ground water . Rain also played a huge role in contributing to the factors of flooding.

2.7.1 Types of rain

There were a few types of rain which are :

1. Convective rain
2. Mountain rain

2.7.1.1 Convective rain

This rainfall occurs from the movement of the warm air that rises up. This rainfall occurs in a short time and it happens in the tropics along with thunder and lightning. The sun heats the air at the surface of the earth from morning till evening. Hot air expands and rises to the top because the air is lighter than the surrounding air. This incident is called convection. The air will rise to several thousand meters above and then , the condensation took place, which is turning the air into clouds. The Clouds formed is called 'kumulonimbus' . Eventually the cloud will turn into heavy rain. This rain often occurs in the evening with lightning and thunder. It always happened in areas that are less than 50km square and in less than 6 hours. This rain is called convective rain.

2.7.1.2 Mountain rain

This rain is usually occurs in areas such as mountainous regions. Normally, this rainfall occurs for a long time. When the northeast monsoon and southwest monsoon winds blow, it will rain heavily in the mountains and high hills. When the wind is blowing from the sea is and was blocked by high land, it will move on quickly. Then the air in the wind happens to be cold and therefore the condensation took place and then, the clouds are formed. When the cloud is much higher, the rain will falls heavily on high ground.

CHAPTER 3

METHODOLOGY

3.1 Introduction

Generally, the data needed to predict the surface runoff the study area is flushing data, river flow data and data for physical properties the study area such as soil type and soil moisture content. These data were then analyzed to study the flood occur on November 2010 till January 2011 and also to study the flood hazard management in Malaysia.

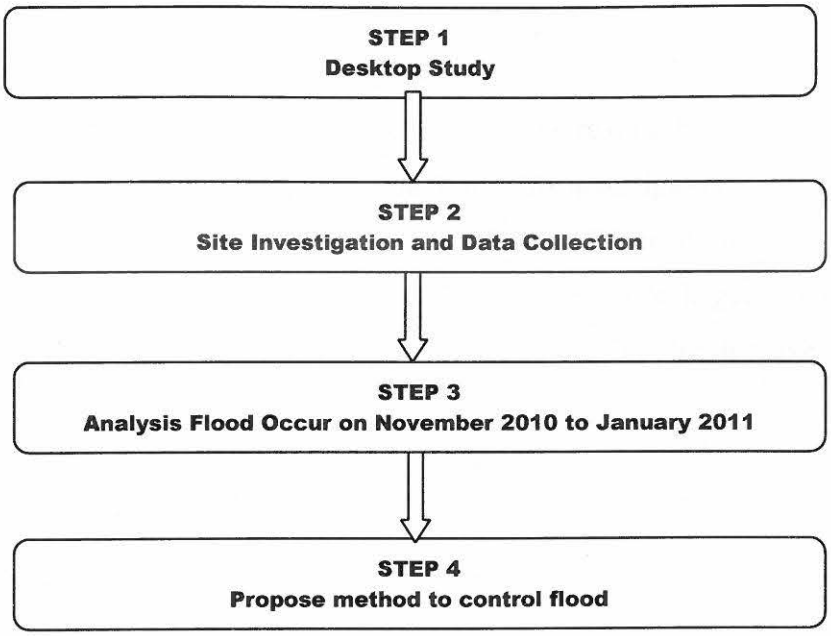

Figure 3.1: *Outline Methodology*

3.2 Desktop Study

During this stage of desktop study, the data was obtained from Drainage and Irrigation Department of Malaysia (JPS) and by doing the interview with the Engineer at Drainage and Irrigation Department of Malaysia to get more information and guidance to complete this study.

3.3 Site Investigation and Data Collection

Site investigation need to be done to know the real problem that occurred before and after the floods event. While doing this investigation, the data such as type of soil, the condition of the soil, the condition of the site will be obtained. Furthermore, during the site investigation, we will get to know the cause of the flooding to occurred and what impacts did it gave to the surrounding area.

Although we get all the data from the Drainage and Irrigation Department of Malaysia (JPS) but, to get more information and to completed this case study on floods occurred in 2010 and 2011, the data were also obtained from Drainage and Irrigation Department of Malaysia (JPS Kelantan). The data were also obtained from others sources such as from Meteorology Department in Kota Bharu, Kelantan.

3.4 Analysis Flood occurred on November 2010 to January 2011

Throughout the data obtained, the analysis of the flood from November 2010 to January 2011 had been done. The flood occurred was merely because of the heavy rainfall that occurred on that period of time. Because of the heavy rainfall, Kelantan are having three phase of flood events which occurred on the early November to early January. Analysis flood was done with the interviewing and the data collected. Through this analysis the real causes of the floods event can be obtained.

3.5 Propose Method to Control Flood

There are a few methods to control floods which are afforestation which is planting the trees to increases interception rates and reduces surface runoff, deepening the river to dig all the mud, dirt and debris found in the river, using artificial levees to make the river banks higher, controlling the human activities and also using the dams and reservoir to hold back and regulate the flow of the river. But, to control the floods event, the right method need to be done. And to obtained the right method to control floods event, the site investigation need to be done first in order to get the right method to control this flood.