



FLOOD DISASTER MANAGEMENT IN MALAYSIA:  
A CASE STUDY OF PEKAN TOWN PAHANG  
MALAYSIA

BY

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A dissertation submitted in fulfilment of the requirements  
for the degree of Master of Urban and Regional Planning

Kulliyyah of Architecture and Environmental Design

International Islamic University  
Malaysia

August 2012

## ABSTRACT

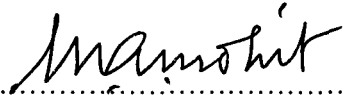
Flood is the most significant natural disaster in Malaysia in terms of population affected, frequency of occurrences, area extent, flood duration and social-economic damage. It has been estimated that about 29,720 km<sup>2</sup> or 9 % of the total land area of Malaysia is prone to flooding, affecting some 4.9 million people or 21 % of the population. The basic cause of flood in Malaysia is the incidence of heavy monsoon or convective rainfall and the resultant large concentration of runoff which has been exacerbated due to rapid development in the river catchment and deteriorated river capacity. As a result both the frequency and magnitude of flooding have increased in Malaysia in recent decades. With 68% of the Malaysian population now residing in urban areas, flash flooding in urban areas are perceived to be the most critical flood type surpassing the monsoon flood since the mid-1990s. Pekan town serves as the economic and administrative capital for the Pekan district, in the state of Pahang, Peninsular Malaysia. The town is located on the banks of the Pahang River and it always suffers both economic damages and physical destruction caused by floods. The population of the town is on the increase due to the concentration of economic activities and social facilities. This requires the state government and the local authorities to construct more roads, which also increases the solid surface. Once there is heavy rainfall, it becomes difficult for surface run-off to be contained into the narrow drains. The water then enters into shops and homes which are mostly with very low foundation sometimes just under the height level of the road. The poor land use and sitting structure of the houses in the town centre is a factor responsible for water to penetrate through. Elevated structures prove that it can be a good strategy for the management of flood waters. This study has identified two major causes of flood in Pekan town and its surrounding areas. These are - the overflow of the Sungai Pahang (which runs from Cameron highlands and empties through Pekan town into the South China Sea), and the high tide through increase in sea level that affects coastal communities. The first factor can be termed as a regional factor due to the river course running into Pekan town. The second factor is the rapid rate of development which is not adequately monitored with poor land use policies development at the Pekan town and its surrounding areas. This later contributes to increase in run offs as rivers overflow their banks damaging properties and displace hundreds of people. This has in turn increased the flood frequency and its magnitude over the past 30-40 years. The 2007 floods recorded only one death but millions worth of damages. Recently, in January 2012, Pekan town and its surrounding areas suffered a flood disaster which affected more than 500 victims. In Kampung Cenderawasih alone, 260 victims from 70 families were affected, (New straight times News paper).

## ملخص البحث

الفيضانات هي الكارثة الطبيعية الأكثر أهمية في ماليزيا من حيث عدد السكان المتضررين، وتواتر الأحداث، ومدى المنطقة أو فترة الفيضانات والأضرار الاجتماعية والاقتصادية. وتشير التقديرات إلى أن حوالي 29720 كم<sup>2</sup> أو 9٪ من المساحة الكلية للأراضي في ماليزيا عرضة للفيضانات، مما يؤثر على بعض 4.9 مليون شخص أو 21٪ من السكان. السبب الأساسي للفيضانات في ماليزيا هو حدوث هطول الأمطار الموسمية الغزيرة أو الحمل الحراري والنتيجة تركيز كبير من الجريان السطحي والتي تفاقمت بسبب التطور السريع في أحواض الأنهار وتدهور القدرة النهري. ونتيجة لذلك زادت على وتيرة وحجم الفيضانات في ماليزيا في العقود الأخيرة. مع 68٪ من السكان المقيمين في ماليزيا الآن في المناطق الحضرية، وينظر فلاش الفيضانات في المناطق الحضرية ليكون نوع من الفيضانات الأكثر أهمية تجاوز الفيضانات الموسمية منذ منتصف 1990. بيبكان بلدة بمثابة العاصمة الاقتصادية والإدارية للمنطقة بيبكان، في ولاية باهانج من، شبه جزيرة ماليزيا. وتقع المدينة على ضفاف نهر باهانج وأنها تعاني دائما كل الأضرار الاقتصادية والمادية الناجمة عن تدمير الفيضانات. سكان بلدة في ازدياد نظرا لتركيز الأنشطة الاقتصادية والمرافق الاجتماعية. هذا يتطلب حكومة الولاية والسلطات المحلية لبناء المزيد من الطرق، مما يزيد أيضا سطح صلب. مرة واحدة هناك أمطار غزيرة، يصبح من الصعب على الجريان السطحي لتكون موجودة في المصارف الضيقة. ثم يدخل الماء إلى المتاجر والمنازل التي هي في معظمها مع مؤسسة منخفضة جدا في بعض الأحيان فقط تحت مستوى ارتفاع الطريق. وسوء استخدام الأراضي وبناء المنازل يجلس في وسط المدينة هو العامل المسؤول عن المياه من خلال لا احتراق. هياكل مرتفعة إثبات أنه يمكن أن يكون استراتيجية جيدة لإدارة مياه الفيضانات. وقد حددت هذه الدراسة سببين الرئيسة للفيضانات في مدينة بيبكان والمناطق المحيطة بها. هذه هي - فيض من باهانج سونجاي (الذي يمتد من المرتفعات كامبرون ويصب في البلدة بيبكان في بحر الصين الجنوبي)، والمد العالي من خلال الزيادة في مستوى سطح البحر الذي يؤثر على المجتمعات الساحلية. يمكن أن يسمى العامل الأول كعامل الإقليمية نظرا لجرى النهر إلى المدينة بيبكان تشغيل. والعامل الثاني هو المعدل السريع للتنمية التي لا تخضع للمراقبة الكافية مع استخدام الأراضي الفقيرة سياسات التنمية في بلدة بيبكان والمناطق المحيطة بها. هذا يساهم في وقت لاحق لزيادة في الموازنة تشغيل ك تجاوز الأنهار ضفافها إتلاف الممتلكات وتهجير مئات من الناس. وهذا بدوره زاد من وتيرة الفيضانات وحجمها على مدى السنوات 30-40 الماضية. سجلت فيضانات 2007 فقط وفاة واحدة ولكن ملايين دولار من الأضرار. في الآونة الأخيرة، في يناير 2012، عانت بلدة بيبكان والمناطق المحيطة بها كارثة الفيضانات التي أثرت على أكثر من 500 ضحية. في كامبونج Cenderawasih وحدها، تأثرت 260 من ضحايا 70 عائلة، في (نيو نيوز مرات على التوالي ورقة).

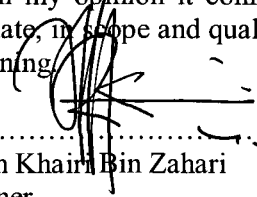
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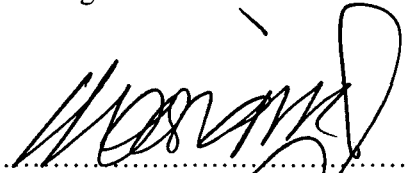
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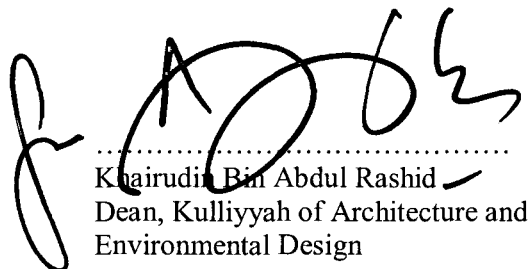
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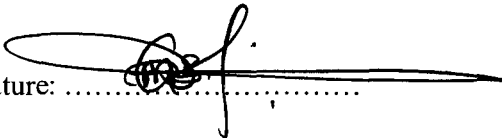
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## DECLARATION

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

Gajikoh Mohamed Sellu

Signature: .....



Date: .....

4<sup>th</sup> September 2012

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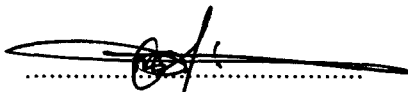
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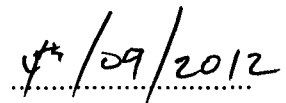
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PEKAN TOWN**

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## Dedication

*I dedicate this dissertation to:*

*My late grandmothers Haja Isatu Gajikoh (Neneh Sougeh) and Fatmata Jarai Gajikoh,*

*my Father Alhaji Mohamed Salieu Gajikoh,*

*my Beloved Mothers Mariama Juldeh Gajikoh and Isatu Bailor Gajikoh,*

*My Aunt Sua'ad Gajikoh and my late Uncle Mohamed Alieu Jalloh*

*My elder brother Abdulai Gajikoh and the rest of my brothers and sisters*

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## LIST OF ABBREVIATIONS

URP	Urban and Regional Planning
KAED	Kulliyyah of Architecture and Environmental Design
IIUM	International Islamic University
DID	Drainage and Irrigation Department
RM	Malaysian Ringgit
HRA	High risk zones
LRA	Low Risk Zones
MRA	Medium Risk Zones
NGOs	Non-Governmental organizations
US	United States
GIS	Geographic Information System
SMART	Storm water Management and Road Tunnel
KL	Kuala Lumpur
LCCP	London Climate Change Partnership
ICZM	Integrated Coastal Zone Management
IADP	Integrated Agricultural Development Project
UNESCO-IHE	United Nation Education Scientific and Cultural Organization for water education



# **CHAPTER ONE**

## **INTRODUCTION**

### **1.0 INTRODUCTION**

Malaysia is highly affected with flood disasters in most coastal settlements and towns located along river routes. The average annual rainfall is 2,400mm for peninsular Malaysia, 3800mm for Sarawak and 2,600mm for Sabah. (Ministry of Natural Resources & Environment)

In 1967 disastrous floods surged across the Kelantan, Terengganu and Perak river basins, taking 55 lives. Few years later, in 1971 a catastrophic flood swept across many parts of the country. Pahang was severely affected, suffering great economic losses to property and crops, as well as a death toll of 24 in Kuala Lumpur (Permanent flood control commission).

Flood occurrences seem to be on the increase with so much economic losses. The federal government of Malaysia has been very much concerned about the frequency of floods over the years. In Malaysia, Flood disaster emergencies are generally very sudden, for example the Shah Alam flood on Sunday 2 February 2006, when more than 2,000 flood victims had to run for their safety suddenly after a rainstorm at 5 o'clock in the morning. The New Klang Valley Expressway and the Malaysian Commuter Train railway were also suddenly closed at that time due to the flood (flood and drought management in Malaysia, June 2007).

The population of Pekan district is almost 103,000 (2000) with 2.06% rate of transition population growth.

Pekan town center accounts for 29179 people in the year 2008. Located on the banks of the Pahang River 50 km south of Kuantan. The district of Pekan has enjoyed a steady population growth since the 1980s. According to the District Local Plan (2002-2015), annual total population for year 1980 is 50,058 while for year 1991 the total population is 86,179. For year 2000, the total population for the area is 97,751 and for year 2003 is 99,886. Pekan annual growth rate for year 1980-1991 is 5.06% while for year 1991-2000 is about 1.41%. lastly, for year 2000-2003 is 0.72%.

Pekan town center serves as the economic and administrative hub of the district. It has always suffered the worse hit in terms of both economic damages and physical destruction caused by floods.

Two major sources of floods have been identified in Pekan; they are the overflow of the Sungai Pahang (which runs from Pahang and empties through Pekan into the South China Sea.), and the high tide that causes increase in sea level which affects low coastal communities. The first factor can be termed as a regional factor due to the overflow of the Sungai Pahang River into Pekan town, and the second factor is the rapid development at the Pekan town and its surrounding areas, this factor contributes to increase in run offs as rivers overflow their banks damaging properties and displace hundreds of people. This has in turn increased the flood frequency and its magnitude over the recent years.

As recent this January 2012, Pekan town and its surrounding areas suffered a flood disaster which affected more than 500 victims. In Kampung Cenderawasih alone, 260 victims from 70 families were affected, Bernama, (Malaysian national news Agency).

With the above background, this study intends to examine the causes of flooding and its impact to the flood victims in Pekan. The study analyzes possible ways of reducing the damages suffered in both economic as well as human deaths through land use planning, zoning policies, environmental planning policies and flood disaster management strategies adopted in other countries facing similar situation. It is anticipated that this research should be able to propose flood disaster management policies that can help to alleviate the vulnerability of the victims of flooding in the Pekan town and its surrounding areas.

## **1.1 PROBLEM STATEMENT**

### **1.1.1 Population distribution and activities in the Pekan town and its surrounding areas**

This examines the population size of the Pekan town centre. Population analysis is necessary for the understanding of the affected people, looking at the population growth of the town; there is a need to analyze the carrying capacity of the town centre based on the facilities and resources available. Flood disaster management studies are social related issues as it deals with man and his environment. It cannot be fully understood without examining the present size of the population and the trend at which the population is growing.

However, this research studied the existing conditions on the effect of floods on the present population so as to plan flood disaster management policies for Pekan town and its surrounding that is adaptive and effective to meet the everyday increasing population of those areas. The higher the population size the greater tendency the land use is changed from its natural green state to other uses such as industries, commercial, infrastructure such as the provision of road networks which all increase

solid land surfaces preventing a quicker percolation of surface running water to be absorbed into the soil. These in turn increase runoffs. Residential areas need to be well planned to give space to the increasing population in order to properly manage the few available land resources rather than just allowing the town to take a “ liaises faire” approach, where in there is no proper development guidelines and principles to follow. This has to do with land use policies and zoning but at the same time highly influenced by the increasing population of the town.

The following data is obtained for the population analysis of the Pekan town centre:

- Total population size 2008 (Mukim Pekan)-29179 people
- Projection(2020)-47,376 people
- Density (Pekan district)-33/sq km
- Growth rate(Mukim Pekan)
- (Studio technical report, URP, KAED, IIUM 2008/2009)

The population increase influences the rate of solid waste and dumping of garbage into drainages. Infrastructures such as road networks, drainages, refuse and sewage disposal units and proper zoning for residential and commercial activities allocation to reduce flood risks in the town as it is the centre of economic activities for the district.

Ethnic Distribution (Pekan District)-83% Malay

### **1.1.2 Poor land use planning and management policies in Pekan town**

Effects from earlier development and no upgrading for improvement is a major problem identified in the Pekan town centre. The town being a royal town, it has

heritage values and land marks of importance that cannot be altered nor destroyed even when it comes to the interest of the general public. There is a need to control development and improve major flood prone areas to reduce flood damages. Some relocation and adaptive reuse can be introduced so as to reduce the vulnerability of floods. Residential areas, commercial centers, schools and industries should be properly allocated in areas where the risk of floods is minimized if not totally avoided.

**Table 1.1 below shows the steady increase of the population of the district from 1980-2003.**

TOTAL POPULATION				ANNUAL GROWTH RATE (KPPT)		
1980	1991	2000	2003	1980-1991	1991-2000	2000-2003
50,058	86,179	97,751	99,886 *	5.06 %	1.41 %	0.72 %

Source: District Local Plan 2002-2015

Flood disaster management is concerned about how best we can reduce the risks and damages caused by floods. The rate of damages varies from one location to another due to the types of topography which is the nature of the land. Mostly affected are settlements closer to rivers, seas and shore line settlements along coastal areas. These coastal areas are the discharge points of rivers with a great importance of agricultural viability. Cities like Cairo, Tibet, became more important due to the fertile lands they occupied in their early stage. Looking at the trend of the population growth of the Pekan district, it has ever continued to be on the increase unlike other towns that are being affected with the syndrome of Rural-Urban migration such as Kuala Kubu Bharu in the state of Selangor. This is due to the strategic location of the town and its economic potentials.

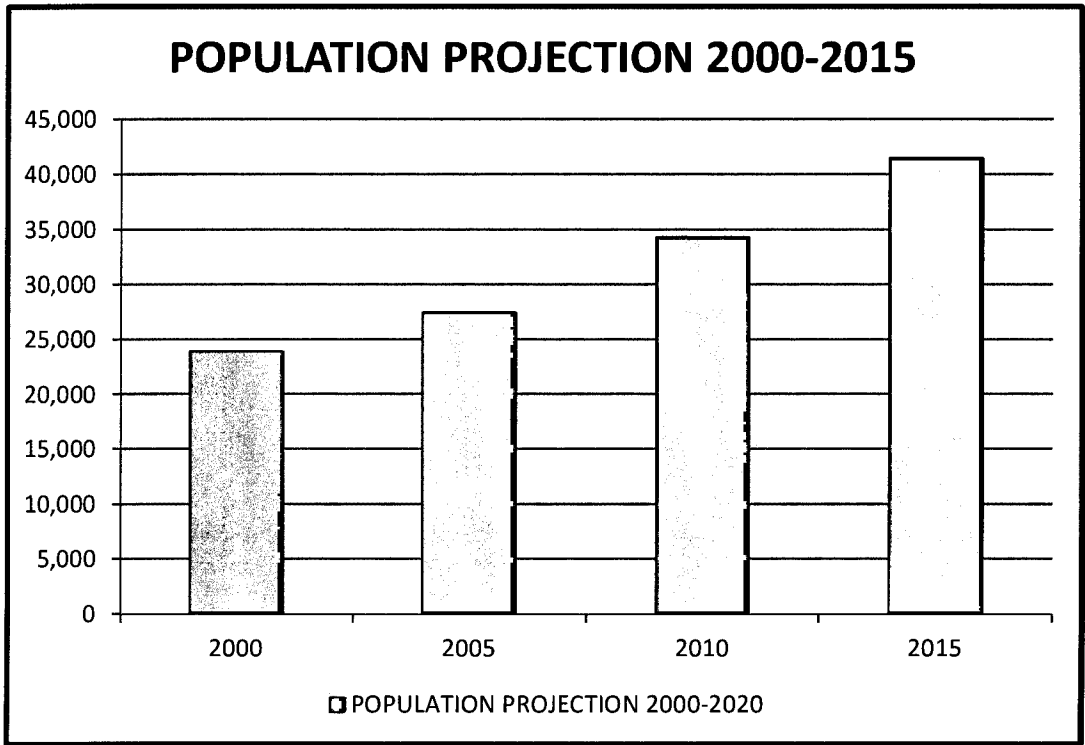


Figure 1.1: shows population projection to increase by on the total population from the year 2000-2015 in the Pekan town centre and its surrounding areas.

Source: District Local Plan 2002-2015

From the table we realize that the population of the district will continue to be on the increase due to the envisaged development, job opportunities and economic potentials of the district.

If an urgent land use planning strategy is not adopted to plan for the future projected population, flood disasters will be worst in both economic loss and social insecurity of the local residents of the district, and the cost recovery will be very high for the government to bear if the preparedness stage is not well handled and managed through proper land use planning policies.

### **1.1.3 Urban development**

A major problem identified at Pekan town and its surrounding areas is the rate at which urban development is being carried out. Urban development changes the land use and increase the solid surface of the town; this increases runoffs due to surface running water that is not absorbed by the soil and causes flash floods which destroys millions worth of properties and homes. A flood causes disasters when it affects economic and human lives and settlements. In 2007, the flood disaster that struck Sungai Pahang lasted for 8 days in Pekan town and its surrounding areas.

The inundation depth at Pekan town increased from 1.0 to 2.0 m (DID, 2007). Most of the flood waters could not easily be absorbed into the soil. This resulted to the death of two people and caused economic losses to brought all administrative and commercial functions to a standstill. The transport sector was affected causing standstill along all the roads in the town center keeping residents indoors for over a week. Other towns in the Pekan district also suffered death casualties. 1 at Rompin, 3 at Temerloh, and 2 at the maran district. The flood damages were given at state level at RM 263 million by DID (DID, 2010).

The worst to be hit were Kuantan and Pekan town and its surrounding areas. This is due to the land use and economic activities cantered around these places. The rate of urbanization is on the everyday increase leaving little or no route on penetration for surface water to percolate into the soil. This urbanization and activities at the town center has now become a major issue in the town centre on how to manage floods in Pekan town and its surrounding areas.

Flooding was responsible for the death of two people in Pekan town (Bernama).

January 13 this year, 260 victims from 70 families from Kampung Cenderawasih, were due to the increase in surface water that fails to percolate quickly into the soil.

The duration of flood waters and their level of inundation throughout the world cities are due to the high rate of urbanization with little attention paid on the future carrying capacity of their drainages and how they discharge. This study gives an in depth analysis into this case.

#### **1.1.4 Lack of proper zoning (Incompatible land uses in the Pekan town)**

A major issue in the Pekan town and its surrounding areas is poor zoning methods (DID). This is a major obstacle to planning and sustainable development. The importance of zoning according to Wai-Chung Lai, in his welfare economics theses of market failure "*Zoning and Property Rights: A Hong Kong Case Study (1988)*" is based on three objectives.

“To separate incompatible uses which generate negative externalities.

To integrate compatible uses which generate positive externalities so that they are mutually beneficial?

To interject public goods like roads and open space in suitable locations”.

However this lesson is not well adopted in the case of Pekan town and its surrounding areas.

We seek to address the problem posed by flood disasters in the district, and at the same time, it is evident mixed of land uses have serious implications to this cause due to the two main conflicting land uses. These are residential, commercial and