THE IMPACTS OF LAND USE CHANGE ON WATER QUALITY IN AMPANG WATERFRONT, SELANGOR, MALAYSIA

BY

AKO MUSTAFA RASOOL

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

Kulliyyah of Architecture and Environmental Design

International Islamic University
Malaysia

FEBRUARY 2013

ABSTRACT

The land use development and increasing population has brought significant changes in land cover and placed stress on water quality within tropical river catchments, including those of Malaysia and especially Ampang waterfront. There is a need to investigate the impact of land use changes on water quality, such as Ampang River, which is located in Ampang Jaya, since these provide the water resources that cater for the rapid urbanization and industrialization that characterizes Malaysia. The research aim is to determine the impact of surrounding land uses on environmental status of Ampang waterfront, which guided by four objectives. Different land uses are associated with different activities, and these activities may be directly or indirectly affect the quality of the waterfront. Findings from this study provides information for local river managers, development planners, and will assist them in minimizing the negative impacts of development on water resources, while promoting sensible planning within river basins especially in the newly developed catchments such as Ampang Jaya. An analysis of land use in the Ampang waterfront indicates that, there has been a significant change happen in the land use of Ampang Jaya because of the urban area that increased. This study suggests that up-scaling the findings of small catchment studies of forest removal is far from simple, especially in the wet tropics, where the impact of tree crops on water relations may be insufficiently distinguished from primary or secondary forests. According to the findings of the research, there is conflict between Ampang waterfront and the surrounding land uses. In addition, the intensity of development in the area (5km radius) is high. This signifies that the planning tools used in controlling development in the area are not effective enough. Commercial activity is among the main activities that affects the waterfront. Its effects manifests in different ways such as water pollution, land degradation, urban runoff and seasonal flooding. This can be through expansion of commercial lands and the use of agro-chemicals industrial activities affect the waterfront in various ways such as water pollution, also flora and fauna extinction in the river.

ملخص البحث

يهتم هذا البحث بتأثير استعمالات الأراضي على جودة المياه في منطقة (أمبانج ووتر فرونت - Ampang waterfront) . فقد أدى تطوير استخدام الأراضي وتزايد عدد السكان إلى تغييرات كبيرة في استخدام الأراضي والتشديد على جودة المياه داخل مستجمعات الأنهار الاستوائية ، بما في ذلك ماليزيا وعلى وجه الخصوص الواجهة النهرية لـ (أمبانج ووتر فرونت - Ampang waterfront) . ويهدف البحث إلى تحديد أثر استخدامات الأراضي المحيطة على الحالة البيئية في الواجهة النهرية (أمبانج ووتر فرونت - Ampang waterfront)، التي تسترشد أربعة أهداف. وترتبط استخدامات الأراضي المختلفة مع مختلف الأنشطة، وهذه الأنشطة يمكن أن تؤثر بشكل مباشر أو غير مباشر على جودة الواجهة النهرية. و تكمن أهمية هذا البحث في الحاجة إلى تحقيق حول تأثير التغيرات في استخدام الأراضي على نوعية المياه، مثل (نهر امبانج - Sungai Ampang) ، والذي يقع في (امبانج جايا - Ampang Jaya) ، لأن هذه توفر الموارد المائية التي تلبي احتياجات سرعة التطور في المناطق الحضرية و تطور الصناعة التي تمتاز بها ماليزيا على وجه التحديد . و ينجم تلوث المياه عن المصادر الثابتة والغير ثابتة. و تشير هذه الدراسة إلى ضرورة العمل على زيادة نتائج الدراسات في المستجمعات والأحواض الصغيرة الناتجة عن إزالة الغابات ، وخاصة في المناطق الاستوائية الرطبة، حيث يمكن أن تؤثر محاصيل الأشجار على العلاقات المائية. وفقا لنتائج البحث، هناك صراع بين (أمبانج ووتر فرونت - Ampang waterfront) واستخدام الأراضي المحيطة بها وخصوصا التنمية الكثيفة في المنطقة على حدود (دائرة نصف قطرها ٥ كلم) في المنطقة المذكورة. هذا يعني أن الأدوات المستخدمة في تخطيط التنمية المسيطرة في المنطقة ليست فعالة بما فيه الكفاية. ويعد النشاط التجاري من بين الأنشطة الرئيسة التي تؤثر على الواجهة النهرية. وهذا التأثير ظاهر بشكل واضح وبطرق مختلفة بتلوث المياه، وتدهور الأراضي، والجريان السطحي في المناطق الحضرية والفيضانات الموسمية. وهو يمكن أن يكون أيضاً من خلال التوسع في الأراضي التجارية، واستخدام الأنشطة الصناعية الزراعية والمواد الكيميائية الموجودة في النهر مما يـ دي الى تلوث المياه، و انقراض النباتات والحيوانات أيضا في الأنهار. ومن النتائج التي تقدمها الدراسة هذه الدراسة معلومات لإدارة الأنهر المحلية ، ومخططي التنمية، وتساعدهم على التقليل من الآثار السلبية للتنمية على الموارد المائية، وفي الوقت نفسه تعزز التخطيط المعقول في مستجمعات وأحواض الأنهر وخاصة في الأحواض المطورة حديثا في (امبانج جايا - Ampang Jaya). كما يحدد التحليل في مجال استخدام الأراضي في الواجهة النهرية (أمبانج ووتر فرونت - Ampang waterfront) و لتغيير الجذري الذي يحدث في استخدام الأراضي من (امبانج جايا - Ampang Jaya) بسبب ازدياد المناطق الحضرية.

APPROVAL PAGE

I certify that I have supervised and read this study and that in my opinion, it conform to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Master of Urban and Regional Planning.

.....
M. Zainora Asmawi
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 dissertation for the degree of Master of Urban and Regional Planning.

.....
Rustam Khairi Zahari
Examiner

This dissertation 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 Urban and Regional Planning.

.....
Mariana Mohamed Osman
Head, Department of Urban and Regional Planning

This dissertation 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 Urban and Regional Planning.

.....
Khairuddin Bin Abdul Rashid
Dean, Kulliyyah of Architecture and Environmental Design

DECLARATION

I hereby declare that this dissertation is the result of my own investigations, 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.

Ako Mustafa Rasool

Signature: ..... Date: .....

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

DECLARATION OF COPYRIGHT AND AFFIRMATION OF FAIR USE OF UNPUBLISHED RESEARCH

THE IMPACTS OF LAND USE CHANGE ON WATER QUALITY IN AMPANG WATERFRONT, SELANGOR, MALAYSIA

Affirmed by Ako Mustafa Rasool

....

Signature Date

ACKNOWLEDGEMENTS

Thanks to Almighty Allah for His guidance, blessings and protection throughout my programme.

My sincere gratitude goes to my family for their marvellous support during the course of my studies, which has contributed to this great success. Indeed this is a great achievement.

I would like to thank my supervisor Assistant Prof. Dr. M. Zainora Asmawi for her support, guidance and comments during the process of carrying out this research and throughout my study. Her patience and time dedicated to this research cannot be estimate. May Almighty Allah bless you. My sincere gratitude goes to the entire staff of the Department of Urban and Regional Planning for their support and guidance. May Almighty Allah continue to protect, guide and bless you all.

My gratitude to the agencies and local authorities in Selangor such as: the Department of Irrigation and Drainage, Department of Environment, and Ampang Jaya Municipal Council for their support during the research.

My special appreciation goes to friends and colleagues who have directly or indirectly contributed to the success of this programme, may Almighty Allah bless you all. Also appreciation goes to the entire members of the Kulliyyah for their caring, kindness and hospitality during the period of my study.

I thank you all for the support, kindness and caring.

الإهداء

اللهم لك الحمد كما ينبغي لجلال وجهك وعظيم سلطانك ولك الحمد والشكر على نعمتك التي لا تعد وتحصى وبعد ...

بكل الحب.. إلى رفيقة دربي
إلى من سارت معي نحو الحلم.. خطوة بخطوة
بذرناه معاً.. وحصدناه معاً
وسنبقى معاً.. بإذن الله
زوجتي الحبيبة .. جزاك الله خيراً

إلى من نذرت عمرها في أداء رسالة
صنعتها من أوراق الصبر
وطرزتها في ظلام الدهر
على سراج الأمل
بلا فتور أو كلل
رسالة تعلم العطاء كيف يكون العطاء
وتعلم الوفاء كيف يكون الوفاء
إليك أمي أهدي هذه الرسالة
وشتان بين رسالة ورسالة
جزاك الله خيراً.. وأمد في عمرك بالصالحات
فأنت زهرة الحياة ونورها

إلى من كلل العرق جبينه.. وشققت الأيام يديه
إلى من علمني أن الأعمال الكبيرة لاتتم إلا بالصبر والعزيمة والإصرار
إلى والدي غفر الله لك واسكنك في فسيح جناته
أهدي ثمرة من ثمار غرسه

الى اخواني الاعزاء و اهلي واقاربي
الى كل من له فضل في تربيتي و تعليمي
الى كل هؤلاء اهدي ثمرة جهدي المتواضع

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AWF1	Jalan Ampang Waterfront One (Ampang Waterfront Street No. One)
BOD	Biochemical Oxygen Demand
BP	Block Perancangan (Block Planning)
COD	Chemical Oxygen Demand
DID	Department of Irrigation and Drainage
DO	Dissolved Oxygen
DOE	The Department of Environment
EIA	Environmental Impact Assessment
GDP	Gross domestic product
IIUM	Islamic International University Malaysia
IWK	Indah Water Konsortium Sdn. Bhd
LRT	Light Rail Transportation in Malaysia
MPAJ	Majlis Perbandaran Ampang Jaya (Ampang Jaya Municipal Concil)
SS	Suspended Solids
TDS	Total Dissolved Solid
TSS	Total Suspended Solid
WHO	World Health Organaization
WPKL	Wilayah Persekutuan Kuala Lumpur (Federal Territory of Kuala Lumpur)
WQI	Water Quality Index

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Land use represents the activities that take place on the land. It changes according the activities and needs over space, and time that human beings take the major roll for that. Human activities have great influence on waterfront ecosystem. For sustainable use of waterfront resources, it is very important to understand land use and its implications on waterfront systems. They are associated with various functions such as hydrological function, provision of service for the surrounding inhabitants, ecological value, also moderated the local climate of the region. These resources are fragile in nature and cannot withstand other human activities. Even with the importance and functions attached to waterfront, they are among the most threatened environmental resources.

The threats faced by waterfront can be attributed to underprivileged in land use planning, it can be land use change or land use modification. Land use planning evolves due to the geometric increase in the world population and the need for more land to support human activities through the provision of basic needs such as housing, commercial area, administrative and other facilities. It is also due to the need for protection of the natural environment for the reason that human beings interaction with it is unhealthy and unsustainable. These basic needs could be achieved with land use planning tools such as zoning. Zoning is a planning tool, which delineates areas where certain activities are allowed to take place and often specify details about the physical characteristics (Vince, 2005). It ensures proper presentation of various Land

uses in a manner that allows peaceful coexistence, and as ell, a mechanism used to ensure orderly growth, development and protect property values. Despite the importance of waterfront to the both local and global communities such as moderation of climate, a key factor in hydrological cycle, reduction of flood intensity, recharging of ground water, habitat for various flora and fauna and recreational areas for the local communities. They are being threatened by various urbanization process and various human activities. These raised the issue of the need for conservation and wise use of waterfronts to achieve sustainability.

The research is about the impacts of surrounding land uses on water quality in Ampang waterfront. Ampang waterfront is a place of attraction in the state of Selangor. It offers various functions such as commercial, attraction nodes, leisure places and public place. Ampang waterfront is one of the places located in the BP2 Block Ampang is an area that has been saturated with existing development some of Ampang City Centre, housing estates and facilities planned and good infrastructure. The main land use in the area is land use housing such as Taman Ukay Heights, Taman Bukit Ampang, Taman Keramat, Garden Lights, Kampung Melayu Ampang Jaya and Valley Village.(Ampang Jaya Municipal Council**,** 2011).

This research also focusing towards identifying and assessing the level of impacts of land-uses surrounding Ampang waterfront. The problems associated with this waterfront could be attributed to uncontrolled human activities, development and urbanization (which requires more space for provision of basic human needs such as residential, commercial, roads, and other infrastructure facilities) which could largely be attributed to explosive population growth, and economic expansion (or diversification). The study also identified the efforts of agencies involved in planning and environmental protection such as: Majlis Perbandaran Ampang Jaya (Ampang

Jaya Municipal Council), Department of Irrigation and Drainage Malaysia and Department of Environment Malaysia.

1.2 STATEMENT OF PROBLEMS

As an important subsystem of urban environment, urban river offers many kinds of ecological services, which benefit the city dwellers. However, with the acceleration of urbanization and rapid development of economy, urban river pollution problem are becoming more and more critical. This research describes the current situation of Ampang Waterfront River and shows the rate of water pollution that has been happen in the study area by showing the problems and source of pollution.

With the rapid development of economy and the acceleration of urbanization, the river pollution occurred continuously, which results in the river ecosystems damaged seriously. Vast quantities of domestic and industrial wastewater flowed into the river, which leads to the water system become severely polluted. Accordingly, the function of river as resources was lost and the urban ecology and water environment are seriously deteriorated. The problems of urban river pollution and ecological damage are becoming more and more critical. According to the statistics, by the early 20th century, there is not almost a complete natural river in the world (Perrow MR, 2002). Therefore, it is urgent to develop a cost effective technique to manage the river water quality.

It is evaluate the impacts of urbanization on water quality pollution from an economic view. As discharges of both commercial and residential effluents have increased, clean water has become increasingly scarce. The distribution of houses also had large impacts on river water quality. The increasing of build intensity and service

sector products were both accompanied by increased pollution. Finally, Ampang waterfront facing threats in term of water quality.

1.2.1 Poor Water Quality

There is a need to control and maintain the quality of raw water in the river to ensure the safe quality of available water because the deterioration of water quality reduces the usability of the resources for multi stakeholders (Fulazzaky, 2005). The quality of surface water has become a critical issue in many countries; especially due to the concern that freshwater will be a scarce resource in the future so a water quality monitoring program is necessary for the protection of freshwater resources (Pesce, 2000). Since the data of water quality may be interpreted individually to explore the impact of the elements content in water to the environment and human health in accordance with the experiences and knowledge of personal experts, the results of water quality analysis become doubtful and yield uncertain information (Fulazzaky, 2005).

There is a long history of studies on the land use and land cover-water quality relationship. Such studies have revealed that the type and severity of water contamination often is directly related to human activities, which can be quantified in terms of the intensity and type of land use in the source areas of water that flows into streams and aquifers. One of the most important factors that can affect the quality of a water body is the land use within its watershed. Urban sprawl (particularly the paving of large segments of the landscape) can have significant and usually negative impacts on water resources. Although growth and land use change may be inevitable in many

communities, the way in which growth takes place affects its impact on water quality (Reth, 1996).

Based on the results obtained from both integrated land use and observed water quality data, the negative effects of land use changes on water quality cannot be denied. As years pass by, we can see the reduction in natural land surface. Land degradation has significantly increased with increases in construction and developed agricultural areas. At the same time, a decline in the coastal water quality has occurred. Specifically, extensive increases in the water concentrations of metals have been recorded with the increasing build-up of an area. This phenomenon is significantly related to the land-based activities that produce domestic and industrial wastes. Increases in the development of industries and agriculture will also increase the accumulation of heavy metals in the water (Yunus, 2003).

1.2.2 Human Intervention

Water is crucial for every civilisation and human settlement. Safe and reliable access to clean water throughout the year is fundamental for sustainable population growth and development. The monsoon climate has for a long time challenged human kind to store water for the dry season (Barker, 2004). Most climate models agree that the trend of increasing temperatures due to anthropogenic influences will continue to 2080 and beyond, although there is less agreement on precipitation trends (Wilby RL, 2006). Human activities will have an impact on the quantity and quality of water in our rivers. Increases in population, such as those planned in the South East (SEERA, 2006); (New M, 2007) cause a water loss through abstraction and then a return through sewage discharge, with their added nutrient and chemical contaminant loads at different points in the catchment. Development of urban centres on flood plains