URBAN EXPANSION, DEVELOPMENT PRESSURE AND THE PERCEPTION OF THE LOCAL COMMUNITIES: THE APPLICATION OF GEOGRAPHIC INFORMATION SYSTEM (GIS) AND REMOTE SENSING (RS)

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By

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Your Sincerely
Khalid Sabbar Mohammed
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PEMBESARAN BANDAR, TEKANAN PEMBANGUNAN DAN PERSEPSI MASYARAKAT TEMPATAN: APLIKASI SISTEM MAKLUMAT GEOGRAFI (GIS) DAN REMOTE SENSING (RS).

ABSTRAK

Pembangunan bandar yang semakin pesat merupakan satu daripada isu utama di kebanyakan wilayah di seluruh dunia, yang mengakibatkan kehilangan banyak tanah pertanian dan tanah belum teroka atau tanah semulajadi (nature land). Kebanyakan negara sedang membangun menghadapi peningkatan yang signifikan dalam permintaan tanah bagi keperluan aktiviti perbandaran untuk menampung kepadatan penduduk dan pertumbuhan ekonomi yang pesat. Di Malaysia, perbandaran meningkat daripada 27.6% dalam tahun 1970 kepada 65.4% dalam tahun 2000. Dan diunjurkan akan mencecah 75.0% dalam tahun 2020, menyebabkan perubahan yang signifikan dalam aktiviti penggunaan tanah. Justeru, para perancang dan pembuat dasar perlu memahami perkembangan bandar dalam usaha mengurangkan atau mengawal impak negatif daripada pembangunan bandar. Kajian ini berusaha memahami tekanan yang boleh wujud daripada pembangunan bandar dan mengkaji impaknya terhadap komuniti yang terkesan. Analisis kegunaan tanah dijalankan dengan menggunakan Penderiaan Jauh (Remote Sensing, RS) dan Sistem Maklumat Geografi (Geographical Information System, GIS). Analisis tekstur pula dijalankan dengan menggunakan imej satelit, yang menunjukkan pergerakan landskap melalui masa. Kajian ini juga menggunakan pendekatan GIS dan MCE untuk mengenal pasti kawasan pembangunan baru yang sesuai diteroka. Di samping itu, kajian tentang ekonomi sosial dijalankan menggunakan dua soal selidik, yang melibatkan pembuat keputusan dan komuniti di Balik Pulau. Kajian ini bertujuan mengkaji persepsi komuniti serta perancangan masa depan terhadap komuniti yang terkesan di Balik Pulau. Kajian mendapati penduduk di Balik Pulau mempunyai persepsi yang baik; mereka mengenal pasti isu pembangunan bandar serta

mempunyai tahap kesedaran am yang baik tentang pelbagai isu pembangunan, sebab dan akibatnya. Kajian mendapati wujudnya impak langsung dan tidak langsung yang signifikan daripada pembangunan bandar terhadap persekitaran luar bandar di Balik Pulau. Secara amnya, kawasan yang dibangunkan mengalami perubahan yang signifikan, terutama dari segi saiz, kepesatan serta polanya. Bahagian pulau di Pulau Pinang secara amnya dan Balik Pulau secara khususnya mengalami suatu peningkatan dari segi saiz dan kepadatan di kawasan yang dibangunkan. Terdapat banyak faktor yang menjana tekanan pembangunan terhadap tanah pertanian di bahagian pulau di Pulau Pinang. Dapatan kajian menunjukkan bahawa dalam tempoh pertama di antara 1960 dan 1980, kawasan yang dibangunkan di Pulau Pinang mencatat 2447 hektar. Dalam tempoh kedua di antara 1980 dan 1985, kawasan yang dibangunkan bertambah sebanyak 185.9 hektar; perkembangannya agak perlahan dibandingkan dengan tempoh pertama. Dalam tempoh ketiga di antara 1985 dan 2000, kawasan yang dibangunkan menjangkau 3762 hektar; ia merupakan purata tertinggi dalam perkembangan bandar. Akhir sekali, bagi tempoh di antara 2002 hingga 2010, kawasan yang dibangunkan adalah seluas 752.4 hektar. Dapatan kajian ini akan membantu para perancang dan pembuat dasar dalam perancangan pembangunan yang lestari pada masa depan dan memberi perhatian yang lebih terhadap usaha menyepadukan tanah pertanian dan komuniti luar bandar dalam projek pembangunan bandar pada masa depan.

URBAN EXPANSION, DEVELOPMENT PRESSURE AND THE PERCEPTION OF THE LOCAL COMMUNITIES: THE APPLICATION OF GEOGRAPHIC INFORMATION SYSTEM (GIS) AND REMOTE SENSING (RS).

ABSTRACT

The rapid increase of urban development is a major issue for many regions around the world, which have resulted in astounding loss in agricultural and natural lands. Most developing countries face significant increase in demand for land to satisfy the need of urban activities for increase population densities and fast economic growth. In Malaysia, urbanization has increased from 27.6% in 1970 to 65.4% in 2000 and is projected to achieve 75.0% in 2020.This will cause significant changes in land use activities. Urban development process is one of many causes for land use changes, which has also caused rural environmental changes. Therefore, planners and policy makers should try to understand the urban expansion drivers in order to reduce or control the negative impacts of urban development. This study attempted to understand urban development pressure and investigate the impact on the affected communities. A multi-temporal analysis land use analysis was undertaken by using Remote Sensing (RS) and Geographical Information System (GIS). Textural analysis was performed using the satellite image to delineate the urban areas showing the movement of growth across the landscape through time. GIS and MCE approaches were that used to identify the suitable new development areas, which experiencing urban development pressure. Asocial economic survey was undertaken using two questionnaires where decision makers and Balik Pulau in Penang communities were interviewed. The survey was intended to investigate the perception of the community and to examine the future plans of affected Balik Pulau communities. This study found that the people in Balik Pulau have good perception; they identified urban development

issues and have a good general level of awareness about various development issues, causes and consequences. The study found significant direct and indirect impact of urban development on rural environment of Balik Pulau. Generally, built-up areas experienced significant changes during several periods in size, speed and patterns of urban expansion. Penang Island in general and Balik Pulau in particular experienced an increase in size and concentration in built-up areas. Penang Island has many factors that created the development pressure on natural and agricultural land. The findings of this study showed that in the first period between 1960 and 1980, built-up areas of Penang expanded by 2447 ha. In the second period between 1980 and 1985, built-up areas of Penang expanded by185.9 ha; the expansion in this period was slow compared with the earlier period. In the third period between 1985 and 2000, built-up areas of Penang expanded by 3762 ha; this period had the highest average of urban expansion. Finally, the period between 2002 to 2010 built-up areas increased 752.4 ha. The result obtained from this study will be helpful for planners and decision makers in planning for sustainable development in the future and in giving more attention in trying to integrate agricultural lands and rural community in the future plan of urban development projects.

CHAPTER ONE
INTRODUCTION

1.1 Research Background

Urbanization is a transformation process from traditional agricultural society to modern metropolitan society and it is also associated with major changes in social and economic structures. Rapid urbanization can be defined as the process of social and economic development which transform land uses and will exert pressure on the rural areas and its communities (Liu *et al*., 2005). Urbanization is generally referred to increase in population and settlement which leads to changes in land uses (Atmis, *et al*., 2007; Martinuzzi *et al*., 2007; UN, 2008). Urbanization is one of the most prevalent causes of losses in arable land and retreat of the natural lands. It has transformed rural areas to urban areas through development (Dewan and Yamaguchi, 2009). This process has become the dominant form of landscape disturbance in many parts of the world (Price et al., 2006). In Southeast Asian and African countries, the transition process from predominantly agricultural land use to urban land use is occurring at a faster rate than that experienced in the developed countries (McGee, 2009; Deng et al., 2009; Barraclough, 2004). For example, urbanization rate varies between continents such as in Africa it is at 42.4%, Asia is at 42.7%, Europe is at 74.2%, Latin American and Caribbean is at 79.4%, North America is at 82.3%, and Oceania is at 73.7% (United Nation, 2003).

Urbanization in Asian and African countries is much faster from that experienced by the developed countries such as United Kingdom (UK) and United States (USA). In 1800, for example only 5% of the USA population lived in cities whereas by 1920 it

increased to 50%. However, urbanization in Asian cities was 17.8% in 1950, and it increased to 40% in 2000s. It was projected to increase to 60 % by 2030 (Atmis, et al., 2007).Table 1.1 shows the percentage of urbanization in the world for both developed and developing countries. Urbanization rate in developing countries is expected to be more than those in developed countries. Between 1990 and 2030, the percentage of urbanization increased by 26% in developing countries as compared to 14% in the developed countries (UN, 2009).

Table1.1: Urbanization Rate in the World, Developed and Developing Countries 1950-2030

Regions	Years		
	1950	**1990**	**2030**
World	30%	51%	80%
Developed Countries	53%	74%	88%
Developing Countries.	17%	34%	60%

Source (UN, 2009)

In the past two decades, physical expansion of major cities has pushed urban land uses to great extent and produced a continuous urban landscape which spreads into the surrounding areas. Rapid expansion of cities has created heavy pressure on these areas (Saleh and Al Rawashdeh, 2007). Urban expansion activities started to encroach into rural areas and change land uses surrounding the cities (Yuan *et al*., 2005; Çakir *et al*., 2008; Koomen and Stillwell, 2007). Urban growth is usually associated with and driven by population concentration and other forces in an area such as economic growth, government policy and physical characteristics of the transportation network. This has led to conversion of agricultural land to urban activities (Fazal, 2000; Overbeek and Vader,

2003). In 1970s due to industrialization programs, manufacturing emerged as an important activity in the Southeast Asia, where, manufacturing activity increased within the metropolitan periphery, exurban areas and even rural areas (Hutton, 2004). This activity has caused urban expansion and land use change, and generated social and economic pressure on land in urban spaces, suburban and rural areas (Ma and Xu, 2010). Urban growth leads to socioeconomic and planning problems in the urban and rural areas (Tran, 2006).

Urbanization has become an increasing concern to both planners and decision makers since trends and patterns of urbanization have wide ranging implications on socio-economic development of the countries (Massar, 2001). Furthermore, urbanization will cause land use change, mainly due to urban expansion that starts to encroach into agricultural land in fringe areas (Jaafar, 2004). Therefore, urban development that expands into the transition zone in East and Southeast Asia are hard to control due to urban growth that is faster than what governments and cities planners can manage (Quang, 2005). China, for example experienced significant growth and transformation of land use due to industrialization programme adopted on series of 5-year economic plans starting from the period of 1953–1957. Furthermore, in 1978 it started economic liberalization policies and industrial become stimulus of growth (Li and Yeh, 2004) has led to expansion of advanced manufacturing in the Lower Yangtze, Pearl River Delta, and other coastal regions, at the expanses of agricultural and natural land (Thomas, 2004; McGee, 2003; Yang et al., 2010; Dong et al., 2008). Similarly, Malaysia has experienced rapid urbanization resulted from industrialization and related rapid urban and economic growth and increase of living standards which led to conversion of agricultural land to urban

functions in order to satisfy the demand of growing population (Samat et al., 2011). Urbanization has increased from 27.6% in 1970 to 65.4% in 2000 and it is projected to achieve 75.0% in 2020 (Samat, 2006; Overbeek and Vader, 2003). Variations in the rate of urban population growth in Malaysia between 1970 and 2010 provide another dimension on the nature of the change in the level of urbanization over time. Meanwhile, urban population increased at faster rate through these 40 years where at present 71.1% of total population in Malaysia are living in cities, as shown in Figure1.1.

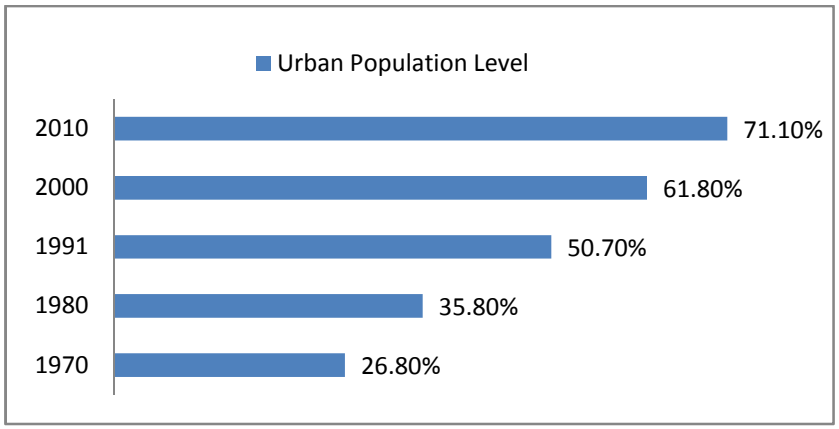

Figure1.1: Urban Population Level in Malaysia between1970-2000
Source: Jaafar (2004).

Level of development of a country is normally specified by land use land cover changes, and these changes can be evaluated by the speed of changes, rate and growth directions, and the type of new uses. At present, issues of land use and land cover change that have caught attention among researchers are: i) modeling the spatial and temporal patterns of land conversion, ii) understanding the impact factors and consequences of these changes. Land use and land cover need to be monitored and planned since land use and land cover changes (Long et al., 2007) might bring impact on food supply and continuous loss of agricultural lands.

This would be undertaken by monitoring land use changes using advance techniques such as Remote Sensing and geographical information system (GIS) (Tran et al., 2002). Remote sensing and GIS were effectively used to identify patterns of urban expansion, to monitor the dynamic changes of land use and to plan future urban expansion (Li et al., 2010, 2007, 2004 and 1998; Jat et al., 2008). For example, GIS spatial analysis techniques played significant role in monitoring, detecting, planning and modeling land use changes (Currit, 2005; Lambin et al., 2003). The information on urban expansion trends and areas experiencing urban development pressure are useful for future planning (Shalaby and Tateishi, 2007; Rajitha et al., 2007). Moreover, land use land cover changes also could have caused environmental and social problems to some areas. At present, limited studies have been undertaken on the consequences of land use land cover changes and the impact on agricultural land and the effected communities (Weng, 2002; Tan et al., 2005; Gennaio et al., 2009).

Various studies have been undertaken that investigated the effect of urban expansion and degradation of rural environment (Price et al., 2008; Jingan et al., 2005; Abdullah & Nakagoshi, 2007). For example, Maruani and Amit, (2010); Peng et al., (2007) studied urbanization and its impact on the soil, water pollution and the negative effect on biodiversity. Besides, Gomiero et al, (2000) Hutton, (2004) Overbeek and Vader, (2003) investigated urbanization and an unprecedented pressure on the coastal environment. Furthermore, Yang et al., (2010) Ali and Jusoff, (2007) addressed the impact of land use changes on environmental degradation on the wetlands, and low land. The study by Raddad et al, (2010) identified main factors influencing agricultural land use change in the urban environment. Those studies found that rural land is changing

rapidly and thus needs to be monitored. Those studies, however, have not attempted to understand problems and perception of the rural communities living within areas experiencing urban development pressure.

The study by Yang *et al*. (2010) for example focused on the communities' perception on rapid urban expansion and its impacts on their areas. That study assessed people's perception on the effects of the development on urban and rural environment, the satisfaction of people and the government desires to achieve sustainable development. Similarly, Badland *et al*., (2000) claimed that people agreed to develop rural areas but it has to be undertaken with proper planning. Furthermore, sustainable development should be adopted and be part of rural planning in order to conserve rural aspects and agricultural lands (Cai *et al*., 2009; Tran *et al*., 2002). Though these studies investigated communities' perception on urban development pressure impacts, not much concern was made to understand their future plans. Such information would be useful towards planning to ensure the local communities could also benefit from urban development surround their areas. Therefore, the perception and future plans of the community living in the areas experiencing development pressure are useful for planners and policy makers in formulating policy that could be utilized in controlling and managing urban growth and development.

1.2 Problem Statement

Urbanization generates huge pressures on agricultural land which would cause severe implications for food security and socio-economic conditions of the communities. Furthermore, it may threat the existing of agricultural activities especially at the urban

fringe. For example, urbanization in the Southeast Asian region experienced by cities has caused reduction of agriculture land size, environmental, social, and cultural degradations mainly due to rapid urbanization. These problems have now received considerable attention from planners, researchers, and policy makers since more than three-quarters of urban food supply is originating from these rural-urban areas (Jackson-Smith and Sharp, 2008). Thus, in the face of increasing urban expansion toward the rural areas, climatic change and socio-economic conditions, and the consequential effects on food prices, agriculture at the peri-urban interface has become an issue of global interest and concern (López et al., 2001).

Malaysia is continuously undergoing rapid urbanization and experiencing, changes both in economic and social domains, where the rate of urbanization has increased from about 25% in 1960 to 65% in 2005 and is expected to exceed 70% by 2020 (Ho, 2008; Norizan and Zikri , 2011). Currently at the stage of post industrial country with an increasingly established planning norms that have served well in the past are often inadequate to face the challenges of today and the future, and perhaps because of some of limitations to achieve many of the current planning goals can be seen as symptoms of these inadequacies (Shah et al., 2010) .Thus, the Malaysian government has implemented decentralization policy to achieve regional balance and prevention of primate cities. For many states, relatively their urbanization rates are higher than the national average urbanization (62%). Those states include Selangor 87.6%, Penang 80.1%, Malacca 67.2% and Johor (65.2%). The increase in urban population is a key feature of urban development in Malaysia (Ho, 2008). For example, social, economic, industrial and infrastructure change over the past few decades has

been rapid. In Penang, for example industrialization started since 1970s, Penang economic and industrial growth rates during 1990s had been phenomenal and well above the national average where the number of industrial factories increase from 31 in 1970 to 430 in 1992 and in 1999 become 694 factories(PDC, 2000).

Based on existing trends, urban growth is expected to continue where Penang would become the leader in industrial development in Malaysia (Chan et al., 1998). Furthermore, state government has planned to transform the island economy into an industrial power by the turn of the century and into a post-industrial society by 2020 (Chan et al., 1998; PDC, 1991). For example Local government has planned many projects to develop towards Penang becoming industrial state. Such an approaches would lead to influx of both national and international labour for neighboring states and countries. Subsequently, the increase of population will cause increase in demand and other related services which will cause built- environment to expand towards in Penang Island. For example, the expansion of built-up areas is expected to expand toward Balik Pulau area which has been spared by urbanization processes in the past. However, recent data has shown that urban settlement has covered more than 30% of the total land area and at the expanse of agricultural areas.

Agricultural land in this area is shrinking due to both urban pressure and growing land requirements of urban activities such as housing, infrastructure, commercial, tourism and businesses (Hubacek and Sun, 2001). The expansion of built-up areas towards the fringe areas needs to be monitored and planned by using scientific and systematic approaches (Samat, 2002) potentially GIS and RS provided mechanism that could be used to investigate trends of urban expansion and identify areas likely to

experience urban development pressure (Koomen and Stillwell, 2007; Herold et al., 2003; Irwin et al 2003). For example Samat 2009 and Samat 2002 had used GIS and spatial model to investigate urban expansion in Seberang perei Penang state, and Tan et al, (2010) had used RS to evaluate urban expansion and determine land use/land cover changes in Penang Island. Those studies however had focused on evaluation the spatial expansion of urban areas onto agricultural land.

The communities living at the fringe of urban areas communities face many challenges due to urban development pressure. The affected communities may face hardship as their farms and villages were encroached by built-up environment (Upchurch and Teivane, 2000; Rajitha et al., 2007; Long et al., 2007). Although urban expansion brought positive effects to the local communities, who participate in formal and informal job sectors, it has also created several negative effects like threatening the traditional way of life and rural culture, decrease in land size, and environmental and cultural degradation (Ghazali, 1999; Ghazali, 2010; Samat et al., 2011; Tran, 2006). Although many studies have been conducted that investigated the impact of urban expansion at the fringe areas (Samat et al., 2011; Banerjee et al ., 2002; Codjoe, 2010) these studies only focused social economic transformation experienced by the local communities (Ghazali, 1999). Those studies, however, had not investigate the perception and future plans of the effected communities. Urban expansion needs to be monitored and controlled in order to ensure balance developments which ensure sustainability of the physical environment and the livelihood of communities (Kamusoko et al., 2009; Ahmad et al., 2009). The study intends to answer the following questions.

1- What was urban development trend and which areas are likely to experience urban development pressure in Balik Pulau ?

2- What are the impacts of urban development pressure on the communities in Balik Pulau?

3- How the local communities of Balik Pulau perceived expansion of built-up areas in Balik Pulau?

4- How do Balik Pulau communities plan to deal with the encroachment of built-up areas toward their areas?

1.3 Objectives of the Study

1- To investigate urban expansion trends and predict aware likely experience urban development pressure in Balik Pulau.

2- To identify and assess the impact of urban expansion on Balik Pulau communities.

3- To examine the perception of the community regarding the impact of expansion of built-up areas in Balik Pulau.

4- To examine the future plans the local community who has and likely to experience urban development pressure.

1. 4 Significance of the Study

The study assesses urban development pressure and its impact on local communities in Balik Pulau areas. The assessment of urban development pressure and also the perception and future plans of communities are important to ensure urban development would not jeopardize the communities. The information regarding urban development pressure will be useful to formulate appropriate planning policies to guide future growth, so that the effected communities would also receive benefits from such development.

The study, therefore, started with the identification of urban expansion trends with many help to understand the process and direction of urban development. The historical investigation of urban development in Penang Island provided clear picture of urban expansion trends in the past and uncovered drives of urban expansion. This information is very important in the formulating of sound planning policy for the future and in order to minimize the negative impacts of urban development on environment and population. The future potential site for development will be determined based on main driving forces of urban expansion on the Penang Island as a whole and in the study area in particular. It would be used to identify areas experiencing high development pressure. The information regarding areas experience development pressure is useful for affected communities in order to better prepare and plan for their future.

Since the areas to experience urban development pressure is known it would be useful to examine the perception and future plan of the effected communities. The study would evaluate the views of communities towards the urban development which is expected to encroach on to their lands. This evaluation aimed to help the people of Balik Pulau to express their own opinions about the pros and cons of urban development. These views in turn would be useful for both the planners and decision makers in order to minimize the negative effects of urban development on the natural environment and the rural communities. This research will shed light on many issues regarding the views of people about the urban development effects on the rural culture, lifestyle in the countryside, the changes in agricultural land, and social problems. They are beneficial to agencies and planners in order to formulate

development policy that involving the rural communities since these people are directly affected from development policy being practiced.

1.5 Thesis Structure

The thesis is divided into seven main chapters. The first chapter highlighted research background that included urbanization, urban growth, land use and land cover changes, sustainable development and land use planning and communities perception. This chapter also touches problem statement, research questions, objectives, and significance of the study.

The second chapter reviews the existing literatures on urbanization impacts on the natural resources and communities, maps the urban expansion using GIS and RS, reviews studies related to research details, and eventually pinpoints the literature gap for the study. Chapter three discusses study area and data collection. Chapter four discusses the research methodology. The main findings of the thesis such as on spatial and statistical analysis are explained in details in the chapters five and six. Finally, conclusion and recommendations are highlighted in chapter seven.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter discusses previous studies related to the research. It outlines theoretical and empirical background of the study which covers urban expansion, urban development and urban pressure and its impact on the natural areas and rural communities under urbanization concept. This is followed by the discussion on remote sensing and geographic information systems (GIS) previously used in the studies of urban expansion such as in monitoring urban development pressure on rural areas, detecting spatial-temporal changes, identifying urban expansion drivers, and evaluating the potential sites for new development. Finally this chapter discusses the studies related to perception of rural and suburban communities towards urban development pressure on their lands and life.

2.2 Urbanization

Urbanization refers to the movement of people from rural to urban areas, such as from less industrialized regions to more industrialized areas, and can be described by an increase in the population number and extent of cities (Annez and Buckley, 2009). Urbanization has been steadily increasing around the world since the dawn of the industrial revolution 200 years ago (Gaviria and Stein, 2000). Since 1800 the number of urban dwellers has increased dramatically. Global population has grown dramatically with heavy concentration in urban area. The concentration of population was confined to industrialized countries in Europe and North America, but the global trend of urban

concentration occurred in the developing countries by up to 7% yearly. Urbanization was much faster in the developing countries between 1950 and 1990 which increased from 17% to 34%, due to migration from rural to urban (Weber & Puissant, 2003). So, during the last century, this has caused rapid urban growth which created pressure on land and resources, in both urban areas and rural areas (Atmis et al., 2007). As a result, world's developing regions are experiencing changes demographically, economically and environmentally (Masek et al., 2000).

Urban expansion happens because of spatial concentration of the population in urban areas, that is due to increase in land demand for residential and urban-services. Urbanization has become a worldwide phenomenon, although the rapidity of changes varied considerably between countries and regions, (Paciano, 2005 and 2003). For example by 1920, 50% of the population lived in United States of America (USA) cities but only 17.8% of population in the developing countries lived in cities in 1950. Historically the populations in cities in Europe and USA started to increase significantly in the 18th and 19th centuries. However, in Asia urbanization started in the first half of the 20th century. Southeast Asia cities, for example have experienced rapid urbanization in the last 60 years. Table 2.1 shows level of urbanization in Southeast Asia countries from 1950 to 2000s. Malaysia like Singapore and Philippines also experienced high rate of urbanization, but other countries have shown the lowest level with 40% and below (McGee, 2009).

Table 2.1: Urbanization levels of Southeast Asian countries between 1950 -2000.

Country	Urbanization level					
	1950	1960	1970	1980	1990	2000
Brunei	43.4	42.8	44.0	49.7	n.a	n.a
Singapore	98.0	100.0	100.0	100.0	100.0	100.0
Indonesia	12.2	14.9	17.1	22.2	30.6	40.3
Malaysia	24.5	30.0	33.5	42.0	49.8	57.5
Philippines	19.8	21.4	33.3	37.5	48.8	59.0
Thailand	10.0	11.4	20.8	24.5	32.5	40.0
Vietnam	n.a	n.a	18.3	19.2	19.9	22.3
Myanmar	12.9	14.3	22.8	24.0	24.8	28.4

Source: McGee, (2009)

This process is often negatively associated with population concentration within these countries causing pressure on the suburban areas and land resources. In the context of developing nation, limited funding is devoted to manage such urban development so that it caused negative effects such as pollution, social illness, and hotbed of crime (Dehghan and Uribe, 1999). In addition, rapid urbanization also has large impacts on the landscape and ecosystem function in the cities and surrounding areas (Li et al., 2010). Urban development has cause changes to the physical environment which includes pollution of air, soil, water and hazardous waste, deforestation, flood and drought (Jahi, 2002; Jahi et al., 2009 and 2003). These changes started within 18th and 19th centuries when populations of cities in Europe and USA started to increase significantly which was resulted from "Industrial Revolution". However, in the first half of the 20th century urbanization started in Asia only and in the second half of the 20th century it spreads in Africa (Gibbs, 1963). The following section will discuss theoretical background of urban expansion.

2.2.1 Theoretical background of urban expansion

Within the past 200 years, there has been a steady increase in urbanization. The significant increase of urban population could be seen since 1800 where the number of urban dwellers increased from 100 million to 0.73 billion in 1950, and further increased to 1.52 billion and 2.84 billion in 1975 and 2000 respectively. The UN's (2011) report estimated that today's urban population of 3.5 billion will rise to nearly 5 billion by 2030 (see Figure 2.1 below). World population has experienced unprecedented concentration of urban population and the global population has grown dramatically during the last century where three out of five people live in cities. Southeast Asia is also facing a steady urbanization. In 1950, only 15.5 per cent of its population lived in urban areas. In 2010, it was 41.8 per cent (or about 250 million people) and it is expected to increased to 50 per cent by 2025. Urbanization and economic development are often positively connected and the most urbanized countries are generally regarded as the most economically developed, for example Singapore 100.0%, Brunei 75.7% and Malaysia 72.2% (Sheng, 2011).

The rate of urbanization has not only proceeded at different speeds from one country to another, but has also taken different forms, from a few huge central agglomerations in some countries to many scattered towns in others. These differences are caused by geographical and historical factors as well as economic and political factors (Gaviria and Stein, 2000). Urbanization has caused the expansion of cities toward the peripheries or fringes areas. Recent studies, additionally, showed empirical

regularities in the patterns of urban development in both industrialised and developing countries (Ingram, 1998; McGee, 1999).

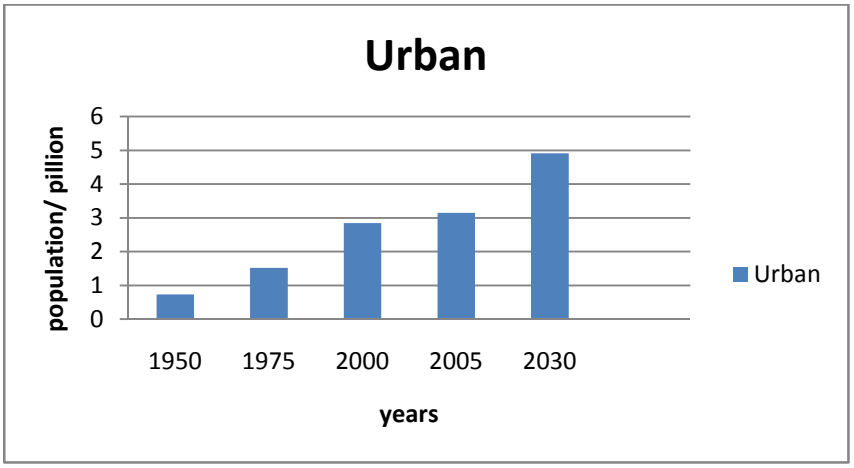

Figure 2.1: Urban Population of the World, 1950-2030
Source: UN (2011)

Urban expansion is considered as an increase in spatial scale or expansion of built-up areas into the peripheral areas of cities. The spatial expansion of urban areas has resulted in three powerful forces: a growing population, rising incomes, and falling commuting costs (Brueckner, 2000). Furthermore, the expansion of built-up areas has a pressure on land and resources in urban and rural areas.

Urban expansion process shows that agriculture at the peri-urban area is actively influenced by both external and internal forces. The effects of globalization on cities are complex, multifaceted and geographically diverse. As a result of national policy changes over the past two decades, the urban impacts of increasing global connectivity in the developing countries have been sudden and swift, compared with the more gradually formed transborder linkages of cities elsewhere in Asia. In each country, the shift to a market economy, opening up to outside investment, and the subsequent acceleration of economic change have prompted the rapid expansion of urban spatial economies (Leaf,

2002). The economies of several developing countries shifted towards industry and service-based industry (Ghazali, 2000; Wilson, 2007). At the national level, agriculture at the peri-urban areas has been affected by policies adopted by successive national governments. For example, the inequality of development and expansion of urban-based industrialization at the expense of the rural economy catalyzed the drift of the rural population to urban centres causing rapid urbanization. This unplanned expansion tends to put more pressure on agriculture and threatens its very existence (Johnston and Bryant, 1987).

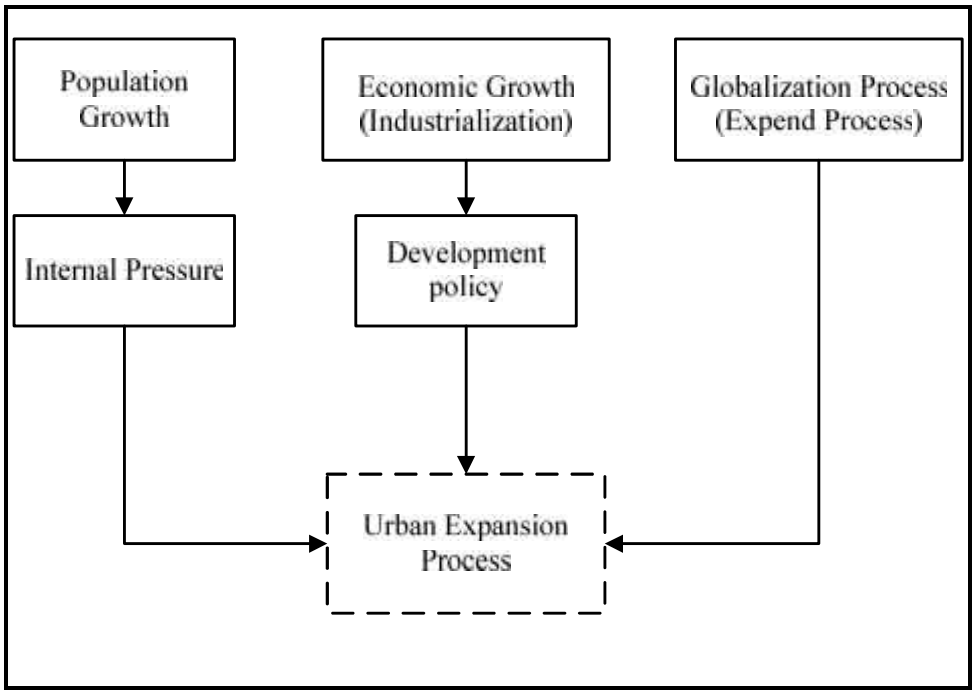

Figure 2.2: Modified Theoretical Framework
Source: Johnston and Bryant (1987).

The availability of road infrastructure allows commuting on a regular basis so that it turns into a driving force behind urban expansion at the fringe or peri-urban area. Peri-urban areas is defined as an area holding characteristics of rural style and activities

(agriculture) but due to the daily and easy access to cities, the livelihood of the local communities is being transformed into urban life style and becomes more urban than rural (Eric, 2004; Ghazali, 2011). These changes in the peri-urban areas did fulfil the desired plans because this process has transformed livelihood of the local communities (Lichtenberg and Ding 2009; Gulgun et al., 2009). Furthermore, this process caused a decline of agricultural land and rural employment opportunities. Thus managing the environment of this interface has significant implications, not only for the livelihoods and quality of life of those who live in these areas but also for the sustainability of urban and rural development. This is because the ecological, economic and social functions performed in the peri-urban interface that affects both the city and the countryside (Allen, 2003).

Besides, urban expansion towards the peri-urban areas has also caused environmental problems which required new policies that inspect and address both physical and the social problems coming from the rapidity and occupational changes from agricultural to non-agricultural activities (Adell, 1999). The impact of urban expansion on peri-urban areas caused changes in ecological balance, loss of agricultural land, changes in farming practices, livelihoods and life-styles, and pollution (Firman, 1996). The study of urban expansion process focuses on the communities and households response and helps in the formulation of more appropriate policies (Redman and Jones, 2005). This research, thus, aims at generating a sound knowledge on rural-urban relationship that will help policy makers and planners to realize the importance of this relationship and to provide better plans that will create a more sustainable

development. Moreover, it creates urban and rural collaborative partnership in specific localities that reduces the consequences (Chen, 2006).

Urban expansion in the developing countries and the rest of the world did not rely on mere description of related phenomena and its effects. The growth of the number and size of cities is not randomly changed, but this change is associated with their opinions as to the rules, laws, factors and variables that can control the directions and magnitudes of the change in the properties of urban expansion. In order to investigate the urban expansion scientifically researchers have developed a number of theories and models for the interpreting the affecting factors in the cities properties such as positions, sizes and numbers of city centres, and how these urban centres are distributed in their territories and surrounding areas (Unwin, 1989).

The growth pole theory is based on the belief that governments of developing countries can induce economic growth and welfare by investing heavily in capital-intensive industries in large urban centres or regional capitals. This growth is supposed to spread to the rural areas in a process of regional development (Rondinelli, 1991; Unwin, 1989). The growth pole theory is underpinned by the belief that "free market forces" provide conditions for development through the existence of the so-called "trickle-down effect" that is meant to put together various economic forces, creating a virtuous cycle that spreads economic growth from urban to rural areas. The growth pole theory has been related to "top-down planning" where a centralised planning system, in response to external demand and innovation impulses, heavily invests in "high technology" urban industrial development (Stöhr and Taylor, 1981).

Louis Davin also (1968) distinguished between two types of growth poles. The theory is used as part of regional development strategy. For example, the French Government, in 1966, adopted the policy of locating eight metro poles throughout France. Using growth pole theory as the basis, the aim is to create more balanced growth, thus reducing the dominance of Paris and at the same time promoting strong regional economies in the provinces (Kinsey, 1978). Some authors like Douglass (1998) and Firman (1996) declared that in spite of the critics and lack of success, growth pole oriented policies are still widely in use in LDCs, contributing to the maintenance of a conceptual division between the city, seen as a pole of modernity, and the countryside (Adell, 1999). Furthermore, Doan (1995) has found that growth pole strategies are still the second most important development policy in African countries, after the small urban centres policy.

Central place theory focuses on cities where society's needs for defence, worship and trade were met (Maki and Lichty, 2000). Central place theory assumes transportation is a major factor in economic decision making; therefore, as the agrarian economy changed to an industrial economy, people began to locate in cities for proximity to industrial work, and entertainment. This theory is a purely market explanation for the emergence and location of cities. People from the hinterlands gathered in a central place, and cities were born (Maki and Lichty, 2000).

Blaikie and Brookfield (1987) and Brookfield (1999) put an emphasis on the context of political economy, including: who makes the decision to manage land? How the decision is made? and the relative distribution of costs and benefits. Here the dynamic human-environment relationship is unveiled through the regional political

ecology in a chain of explanation: land managers and the land, land managers with each other in the wider society, the state and world economy. The authors believe that the lack of either appreciation or concern for indigenous institutions and technologies has had devastating consequences in land management and land degradation is primarily associated with the exploitation of weaker groups within a society. In short, systematic structural relationships underlie diverse forms of land degradation.

The Dependency Theory views the nations of the world as organized into a "world system" based on capitalism and market connections. Moreover, nations are unequally advantaged in this system, with the "core" nations having the most power and exploiting the "peripheral" and "semi-peripheral" countries. The entry of peripheral and semi-peripheral countries into world markets is believed to result in poverty and population growth, together with unsustainable land-use change (Rudel, 1989).

There are a great number of theories and methods from various disciplines which have helped tremendously to further the understanding of urban expansion and dynamics of land use land cover changes, for example, Globalization and extended metropolitan regions (Currit and Easterling, 2009). McGee and Watters have recently stated that the evolution mentioned above can be subsumed into two main features that are "changing the face of the world geography": globalization, "which assumes the increasing integration of national economies into global systems of production, distribution and consumption" and space-time collapse which is the consequence of the technological improvements in transport, communication and computer technology. (McGee and Watters, 1997) When analyzing the complex interactions between the global and the local, it is argued, there is a need to escape from "the idea of the global

steamroller" constructing new regions, which is the common ideology underpinning globalization discourses. A local-global dialectic where local forces in a variety of forms and levels negotiate with the global would thus be a more adequate framework to analyze the territorial changes that are produced by this dialectic interaction.

McGee further argues that the globalization process is followed by an inevitable increase in urbanization and the emergence of global and sub-global systems of highly linked cities. If current patterns of urban concentration persist, the developing world is expected to experience the emergence of mega-urban regions as major components of their urban systems. Although it has been argued that the current phase of globalization in developing countries is the second after the one represented by their incorporation into the colonial system, the urban consequences are at least of the same importance. One of the consequences of the first wave of "globalization" had been the creation of large primate cities dominating the urban hierarchies of their countries, like Rio de Janeiro, Mexico city, Jakarta or Nairobi which were administrative centers and conduits for the flows of raw materials for the developing world. Even if differences in the time and processes of decolonization (earlier in Latin America) have produced different patterns of urbanization – where Latin America has attained the levels of urbanization of developed countries, and Asia and Africa have just entered the "accelerated" phase of urban transition from rural to urban population – in each of these continents population from migration and endogenous growth of those large primate cities and industrial location on their fringes are actually expanding the urban areas to form what has been labelled as extended metropolitan regions. McGee's major conclusion from this analysis is that macro-trends do not necessarily indicate a deconcentration of urban settlement or

counter urbanization. In fact, while changing the scale and the definition of the urban agglomeration, these processes are actually occurring in a larger zone, where one can find at the same time residential outward movement, changing land use of the inner cores, industrial decentralization into new industrial states and the creation and amelioration of transportation networks. Rigg and McGee selected four major features involved in acceleration of cities growth and dynamic linkages between agriculture and non-agriculture areas in Southeast Asian are:

- Large and dense population engaged in wet rice cultivation;
- Good transport networks;
- Highly mobile population;
- An increase in non-farm (non agricultural) activities;

One particularly influential theoretical and methodological tool is Desakota model. This model explains the relationship and integration between urban and rural areas. The expansion of built-up areas has blurred the boundary between rural and urban areas. McGee (2009) has proposed a territorial model named Desakota, to describe the process of urban expansion toward the fringe which has lead to the formation of territorial patterns between rural and urban areas. Desakota term is coined from the Indonesian words Desa (village) and Kota (town) to describe the intense mixture of agricultural and non-agricultural activities that characterise these regions (Rigg, 1998). The Desakota regions often exist along road network connecting a large city core to smaller town centres. The Desakota has being empirically tested in several cities such as