

**DETERMINING THE HOUSE BUYERS REQUIREMENTS FOR GREEN
HOMES IN MALAYSIA**

BY

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ABBREVIATIONS

HAD	Housing Development (Control and Licensing) Act
JPPH	Jabatan Perangkaan dan Penilaian Harta
LA	Local Authority
OSC	One Stop Centre
REHDA	Real Estate and Housing Development Association
PM 10	Particulate matter less than 10 micron
TCPA	Town and County Planning Association
ACWMASRRB	Alamenda County Waste Management Authority and Source Reduction and Recycling
PWTC	Putra World Trade Centre
SPSS	Statistic Package for Science Social
KLIA	Kuala Lumpur International Airport
CCC	Certified of Completion and Compliance
PDCCOPGBI	Portland Development Commission and City of Portland Green Building Initiative
FTC	Federal Trade Commission
BREAM	Building Environmental Assessment Method
LEED	Low Energy Environment Development
COC	City of Captiola
COSMRW	County of San Mateo Recycle Works
SBD	Secure by Design
ACPO	Association of Chief Police Officer
CPTED	Crime Prevention Through Environmental

DS	Defensible Space
SOHO	Small Office and Home Office
PV	Photovoltaic
RES	Renewable Energy System
CES	Conventional Energy System
PVBs	Present Value of Benefits
MS	Malaysian Standard
Qs	Questions
EFA	Exploratory Factor Analysis
KMO	Kaiser-Mayer Olkin
HVAC	Heating Ventilation Air Conditioning

MENENTUKAN KEPERLUAN PEMBELI RUMAH TERHADAP RUMAH HIJAU DI MALAYSIA

ABSTRAK

Rumah hijau mengandungi enam elemen utama, iaitu rekabentuk dan perancangan masyarakat, keberkesanan terhadap penggunaan sumber, menggunakan sumber alternatif, sistem semulajadi, perlindungan dan keselamatan, pendekatan dalam guna semula dan kitar semula. Elemen ini membentuk banyak keperluan terhadap rumah hijau dikalangan pembeli rumah di Malaysia. Sebagai penyumbang utama kepada kesan negatif, persekitaran global dan tempatan, keputusan tentang kesedaran persekitaran terhadap elemen-elemen rumah hijau adalah sangat penting dalam menyumbang kepada perlindungan persekitaran. Bagi merealisasikan maklumat ini dalam Malaysia, perlunya untuk membangunkan rangkakerja penilaian rumah hijau yang menggabungkan faktor-faktor rekabentuk dan perancangan masyarakat, keberkesanan terhadap penggunaan sumber, menggunakan sumber alternatif, sistem semulajadi, perlindungan dan keselamatan, pendekatan dalam guna semula dan kitar semula. Rangka kerja ini boleh menjawab kepada pelbagai permasalahan di dalam usaha membina rumah hijau dalam industri perumahan Malaysia. Objektif penyelidikan ini adalah mengkaji hubungan di antara faktor-faktor rumah hijau dengan keperluan pembeli rumah terhadap rumah hijau dan membangunkan rangkakerja penilaian untuk rumah hijau. Beberapa hipotesis digunakan untuk memahami hubungan di antara aspek-aspek rumah hijau dan keperluan pembeli rumah terhadap rumah hijau. Tinjauan dibuat dengan menggunakan kaedah kajiselidik secara seliaan sendiri di dalam pengutipan data. Sampel kajian adalah pembeli-pembeli rumah yang menghadiri pameran perumahan di enam negeri dan satu wilayah persekutuan di Malaysia iaitu, Kedah, Kelantan, Melaka, Johor, Sabah dan Wilayah Persekutuan Kuala Lumpur. Responden adalah dipilih dengan

menggunakan teknik sampel mudah. Daripada 2600 borang soalselidik yang dihantar, 1642 borang telah dijawab dan dihantar kembali, kadar pulangan sebanyak 63 peratus. Data dianalisa dengan menggunakan statistik deskriptif, analisa faktor, korelasi dan analisa regresi pelbagai. Hasil kajian menunjukkan bahawa adanya hubungan positif di antara pelaksanaan faktor-faktor rumah hijau dan keperluan pembeli rumah terhadap rumah hijau di Malaysia. Berdasarkan kepada hasil kajian, ini membuktikan lebih tinggi tahap pelaksanaan prinsip-prinsip rumah hijau, lebih baik penerimaan keperluan pembeli rumah terhadap rumah hijau dikalangan pembeli-pembeli rumah di Malaysia. Analisa regresi pelbagai menunjukkan kesemua pembolehubah boleh meramalkan keperluan pembeli rumah terhadap rumah hijau dikalangan pembeli rumah di Malaysia. Kajian ini mencadangkan untuk kajian di masa hadapan memperbanyakkan lagi penglibatan ahli-ahli yang lain sepatutnya dilakukan. Mereka adalah pemaju, pihak berkuasa, pembekal dan kontraktor. Perbandingan di antara mereka boleh memberikan kefahaman yang lebih tinggi berkenaan bagaimana untuk mempraktikan pembinaan rumah hijau bagi menambahbaik keperluan pembeli rumah terhadap rumah hijau di Malaysia.

DETERMINING THE HOUSE BUYERS REQUIREMENTS FOR GREEN HOMES IN MALAYSIA

ABSTRACT

Green homes consist of six main elements, namely community design and planning, efficient usage of resources, use of alternative resources, natural system, protection and safety, and reusing and recycling approach. These elements form the many requirements of green homes among house buyers in Malaysia. As the major contributor to the global and local environmental negative impacts, environmentally conscious decisions on these elements can significantly contribute to the protection of environment. To realise this ambition in the Malaysian, there is a need to develop a green home assessment framework that could integrate community design and planning, efficiency usage of resources, use of alternative resources, natural system, protection and safety, reusing and recycling approach factors. This framework could answer a multitude of problems in building green homes in the Malaysian housing industry. The objectives of this study are to examine the relationships between green home factors and house buyers' requirements of green homes and develop an assessment framework for green homes. A number of hypotheses have been used to understand the relationships between the green home aspects and house buyers' requirements of green homes. A survey by means of self-administered questionnaires has been employed to collect the data. The research sample is house buyers attending property fairs in six states and one federal territory in Malaysia namely, Kedah, Penang, Kelantan, Melaka, Johor, Sabah and Kuala Lumpur. The respondents have been selected with the convenience sample technique. Out of 2600 questionnaires distributed, 1642 answered questionnaires have been returned, a response rate of 63 per cent. The data have been analyzed with descriptive statistic, factor analysis,

correlation, and multiple regression analysis. The result suggests that there are positive associations between the implementation of green homes factors and house buyers' requirements of green homes among house buyers in Malaysia. Based on research findings, the results seem to prove that the higher the levels of implementation of the green home principles, the better house buyers' requirements of green homes among house buyers in Malaysia. The multiple regression analysis shows that all the variables could significantly predict the house buyers' requirements of green homes of house buyers in Malaysia. For future studies, it is recommended more studies involving the other stakeholders in the industry should be done. These are the housing developers, authorities, suppliers and contractors. Comparison of these industry contributors may provide a better understanding of how green homes practices can enhance house buyers' requirements of green homes in Malaysia.

CHAPTER 1

INTRODUCTION

1.1 Introduction

The awareness on environmental issues among Malaysians has led to the construction of green buildings in the country. Over the past few years, Malaysia has experienced a striking increase of population as the direct effect of constant urbanization. The process of urbanization is seen as the major factor for the change in the urban atmosphere. This change, however, is not necessarily positive. The process of urbanization has created problems such as air pollution, improperly managed industrial activities, vegetation suppression, and other external environmental factors (Kruger and Shiers, 2007). These problems have been deteriorating over time and need to be taken care of immediately. According to Ding (2008), there is an urgent need for contractors or the authority to create a building performance assessment that concerns environmental issues. This suggestion, if taken seriously, would hopefully put the problems mentioned to an end.

Based on the previous studies, environmental issues have become the focus for developers in both developed and developing countries. Developing countries must learn from the anthropogenic activities that have been done by developed countries to put a stop on the environmental issues. Rey, *et al.* (2007) demonstrates that the main challenge among developed countries is to maintain their standards of living and comfort because of their high rates of energy consumption. This motivates them to create a sustainable development to ensure future generation meet their needs.

One of the green building criteria used in the more developed countries is that the buildings must have energy-saving characteristic. According to Omer (2007), to enhance the interaction between buildings and climates, the housing industry stakeholders must look at these criteria for their development guidelines:

- Choose good locations that can avoid heights and hollows.
- Adjust the buildings in ways that the orientations could maximise or minimise solar gains.
- Ensure the spacing of the building is well enough to avoid unwanted winds and shade effects.
- Gain the maximum daylight in the building with proper designs.
- Produce proper designs that can prevent solar overheating with shades or window designs.
- Select trees and wall surfaces that can shelter the buildings from driving rain and snow.
- Ensure the ground surfaces are dry.

These instructions could be taken as ways to reduce climate changes in buildings. Some of them are very important and need to be taken seriously to provide comfort to building occupants.

The Malaysian government looks forward to become a developed country in the year 2020. To materialize this vision, the government needs to take the issue of sustainable development very seriously. Nowadays, Malaysia already has a green building index to make sure that everyone in the construction industry will take sustainable development critically. Abidin (2009) asserts that all players in the

industry such as the developers, consultants, contractors, local authorities, manufacturers and purchasers are responsible in making sure their project activities have minimal impacts to the environment. They need to be aware of the ongoing environmental issues as well as the knowledge to solve them.

1.2 Research Background

This thesis presents the results for the investigation on green home aspects among house buyers in Malaysia. The participation of house buyers plays a most important role in the investigation. The findings of the investigation can help housing developers to build a framework or model of green homes that can fulfil the needs of Malaysian house buyers.

This chapter is written to provide a general introduction for the study. Firstly, section 1.2 gives a brief explanation on the research background and housing industry in Malaysia. Then, sections 1.3 and 1.4 present the research problems and objectives respectively. After that, Section 1.5 explains the research questions in details while section 1.6 presents the scopes and limitations. The significance of the study is discussed in sections 1.7. The summary of the research methodology is explained in section 1.8. Section 1.9 briefly outlines the organisation of the whole thesis. Finally, section 1.10 summarises this chapter in thorough.

Since the 1992 Earth Summit in Rio de Janeiro, leading scientists, politicians, and the public are more aware of the need to make the world into a better place by using the natural resources in ways that could not damage the environment (TCPA, 2003).

As a result, the construction of green homes is widely encouraged, so as not to compromise the needs of future generations.

Green home approach benefits both developers and house owners by encouraging market differentiation, improving the quality of lives, increasing efficient usage of natural resources and reducing resource consumption. According to ACWMASRRB (2003), the features of a green home are as the following:

- The building uses recycled building materials.
- The building uses less energy and water.
- The indoor air quality in the house is better.
- The house uses less wood fibre than conventional homes.
- The interior components of the house reduce the use of carcinogenic volatile organic compounds and formaldehyde.
- The construction waste of the house can be recycled or remanufactured for other building products.

ACWMASRRB (2003) claim that green building projects involve the whole systems that approach the designs of green homes in the construction and operation of buildings from the beginning to the end of the development. A green home is the epitome for the convergence of three fundamental objectives, namely the conservation of natural resources, the improvement in energy efficiency, and better indoor air quality.

Green buildings are not just widely accepted in developed countries like the USA, Germany, Australian and Japan. They are also gaining popularity in the developing

countries like Malaysia and Singapore. In Malaysia, there is green index rating system, known as the GBI (Green Building Index) that is used to check whether a building meets the requirements of any green building.

In term of practicality of developing green homes, it is widely accepted that green homes are already a norm in the more developed countries like the USA, Germany, Australian and Japan. Roarty (1997) supports this by stating that the market for green products and services in the Western Europe, Japan and North America is growing exponentially. In Malaysia, the mass development of green homes is still a rarity, and only built for individuals who approach developers and make private demands. Recently, the status and acceptance of green homes development has been elevated to a higher level by a property developer in Melaka. Nevertheless, unlike in the aforementioned countries, the concept is still relatively new in this country, so the proponents of the green homes need to double their efforts in making the homes a norm in the Malaysian housing development industry.

There is however, a similarity between the development of green homes in the developed nations and in Malaysia. Despite the good examples shown by the few successful projects, there have been little efforts to mass-develop green homes so that these houses can be bought easily by house buyers. Because of this scenario, a marketing research focusing on reducing the uncertainties associated with new products such as green homes need to be carried out by any developer to make these houses attractive to the house buyers.

Despite the availability of green technologies that can be utilised in the development of green homes, there is still inertia to develop the homes from many stakeholders in the industry. The housing developers, banks, government and even the house buyers are guilty, in varying degrees, for their negativity towards green homes. For example, although the developers are happy to develop the homes, yet, there is no assurance that there will be demands for these green products. These push and pull factors had inadvertently become the impediment towards making green homes mass development a reality.

1.3 Problem Statement

According to Oktay (2002), a house should satisfy both the need for a shelter and the need for sustainability. Therefore, most developing countries do not just face a similar problem in building environmentally friendly premises, they also have a mutual problem in meeting the prerequisite needs of house buyers. All the aspects in site and building designs should be critically considered. Efforts are needed to provide better houses that meet all the requirements and visions of the future generations in Malaysia.

Essa, *et al.* (2007) assert that the efforts to face the challenges posed by the housing industry should be unified and consolidated in order to meet the sustainability ambition of the industry. Many researchers had discussed the problems plaguing the housing industry and green-related technology issues. Lowrey (1995) argues that previous researches on both green marketing and green consumers suggest that most of the green concepts are notoriously difficult to apply. Al-Temeemi and Harris

(2004) observes that the two most pressing problems happening now are the energy crisis and world's increasing demands for sustainable houses.

Thormark (2002) points out that the most important aim in the construction industry is building houses or buildings in general that are environmentally friendly. This suggests that Malaysian housing developers should apply the sustainability concept to guarantee a harmonious life for everyone in the country.

This research attempts to develop a framework or model that will enable a massive development of green homes in Malaysia. It focuses on the green home aspects that suit the Malaysian environments. This follows Dangelico and Pujari (2010a) argument that says environmental policies and documentation of green standards are needed as guidelines for housing developers to ensure that green products actually meet the requirements to be environmentally friendly. In the developed countries, architects, developers, contractors and owners are given proper guidelines so that they can easily build up sustainable houses.

Another pertinent point covered by this study is the needs and behaviour of the house buyers. According to Welsch and Kuhling (2009) the most important matter for green technology implementation is to understand the concept of consumers' pro-environmental consumption. Understanding pro-environmental consumption is the main obstacle in building green houses. If people could understand it correctly, they would not hesitate to buy or use environmentally friendly products. Pickett-Baker (2008) adds that consumers with high pro-environmental values believe that green products will perform as good as expected but consumers without these values do not

believe so. They still have a doubt about the performance of green products. Paul and Taylor (2008) write that developers should adopt green technology in their housing development projects in ways that fulfil the needs of customers to solve this problem. In other words, they have to understand the customers well before mass-developing green houses. ACWMASRRB (2003), ACWMASRRB (2004) and COC (2008) shows that the residents of green houses only have limited liberty when it comes to contributing ideas while the other people in the list of designers such as developers, architects, associations and city commission have much. Abidin (2009) says the demands of house buyers are highly important to be met if developers really want to attract them. This is why this study is important. It focuses on the opinions of possible house buyers as well.

This study attempts to put into effect a marketing research that looks into the possibility of mass-developing green homes in Malaysia. The research will examine the framework and model of green homes that are already produced in developed countries, examine the differences in the perceptions of house buyers on green home factors, examine the relationships between green home factors and house buyers' requirements of green homes, and develop a multidimensional assessment framework/model for house buyers' requirements of green home in the Malaysia housing development. This research has been based on a premise that the current frameworks or models of green homes have not been implemented in whole Malaysia. Hence, both sides of the existing market will be studied: the providers (consist of property developers, contractor and construction consultants) and the house buyers.

1.4 Research Objectives

There are three principal objectives in this research. These objectives are needed in order to answer the research questions. The objectives of this study, together with the means to achieve them are as follows:

- 1) To examine the existing framework/model of green home that has been produced in developed countries;
- 2) To examine the relationship between green home factors and the house buyers' requirements of green home in Malaysia;
- 3) To develop a multidimensional assessment framework/model for house buyers' requirements of green home in the Malaysia housing development;

This study based on the existing framework that had been practiced in developed countries. The concept of green homes not implement in whole of Malaysia which based on the house buyers requirements. To solve this problem, face-to-face interviews have been conducted with prospective house buyers. The respondents were interviewed so that their requirements for green homes would be well-understood.

1.5 Scope and Limitation of Research

This research aims to examine the house buyer's requirements of green home in Malaysia and to produce the assessment framework or model for green homes that match the local requirements. Questionnaires have been utilised to collect data from house buyers in different states to explore the requirements for green homes among house buyers in Malaysia. Figure 1.1 presents the data collection places namely

Central Square (Sungai Petani, Kedah); Penang International Sport Arena (Bayan Baru, Penang); KB Mall (Kota Bharu, Kelantan); Mahkota Parade (Bandar Melaka, Melaka); City Square (Johor Bharu, Johor); Ones Borneo (Kota Kinabalu, Sabah) and Putra World Trade Centre and Mid Valley (Federation of Kuala Lumpur). Since the topic is too large and not much is known about green homes in Malaysia, the study has some limitations. A green home framework or model is not currently available for developers to use as a guideline. Therefore, it is highly expected that the recommendations from this study will be useful for future housing developments.



Figure 1.1 Location of scope of study

1.6 Significance of Study

This research has three main significances namely:

- 1) A new framework/model for green homes in Malaysia.
- 2) The findings and result in this research will help housing developers to understand the aspects of green homes that are prioritized by house buyers in Malaysia.

- 3) It demonstrates the aspects of green homes that can be used to improve the knowledge and understanding of housing market in Malaysia.

1.7 Overview of Research Methodology

The methodology used in this research is based on the marketing research framework. Many property developers build houses based on their ‘hunches’ and not on their marketing intelligence. The marketing research proposed here would provide a set of ‘informed knowledge’ or intelligence that could be used as a reference point by the government, property developers, contractors, and construction consultant in introducing green homes to the market. The nature of buyer-developer relationship in property development is producer-led which means that the supply and take-up of the housing project is regulated by the activities within the supply industry.

Marketing research is defined by the British Institute of Management (1962) as “*The systematic gathering, recording and analysing of all facts about problems (or opportunities) relating to the transfer and sales of goods and services from producer to consumer*”. The whole framework seeks to translate the operational characteristics of the housing market into a structured appraisal of requirements for energy-efficient buildings and green homes, and to relate these opportunities to supply green homes that would be accepted by the house buyers.

Fundamentally, the demand for property is a product of wider social, economic, technical and organisational change (Guy and Harris, 1995). If house buyers are not subject to these complex processes of change within their business environments, the demand for new buildings would not be available. Similarly, these changes are

worthy of investigation in a scenario where green homes are to be introduced to a new ‘niche’ area in the property market. The failure of property developers to gauge the mood and behaviour of the house buyers before embarking on the new green home projects would create a mismatch in demand and supply in the market.

1.8 Outline of the Thesis

In this part, all the chapters in this report are given brief descriptions. All of the six chapters in this report are outlined as the following:

Chapter 1 is the introductory section in which the reason and direction of this investigation are explained. This chapter includes the background, problems, objectives, questions, and limitations of the research. A brief discussion on the methodology and original contributions of the research to the body of knowledge are also covered in this chapter.

Chapter 2 expresses the foundation of this research. This chapter also contains the current literature on housing in Malaysia and impacts of housing development to the environments. Other contents of this chapter include an overview of green homes. Then, this chapter also discusses the house buyer’s perceptions on green homes. Lastly, the current housing market in Malaysia is also discussed in this topic.

Chapter 3 examines the framework or model of green homes that is used in developed countries and addresses a relevant background for the development of such in Malaysia. This chapter also contains the discussion about the green home framework/model.

Chapter 4 presents the research design and methodology including the research plan, data collection method, type of data collected and the participants involved. It also describes the pilot study, the reliability and validity of the data, and the methods of data analysis to be employed.

Chapter 5 discusses the analyses done on the collected data from the questionnaire measuring the house buyers' requirements of green homes. The analyses of this quantitative non-parametric data could be categorized into descriptive analysis, correlation analysis, factor analysis and regression analysis. This chapter also integrates the findings and discusses the research implication on house buyers' requirements for green homes.

Chapter 6 presents the conclusions and limitations of the research and provides recommendations for future research in this field.

CHAPTER 2

HOUSING DEVELOPMENT AND HOUSE BUYERS BEHAVIOUR TOWARDS GREEN PRODUCTS

2.1 Introduction

This chapter explores the current condition of housing development in Malaysia and its impacts on the environment. This chapter also studies the behaviours of potential house buyers towards green products in the market. It also discusses the process in housing development that has been implemented in Malaysia. However, the focus of the study is still on identifying the behaviours of potential house buyers towards green products like green homes.

2.2 Housing Development in Malaysia

According to Mohamed (2002) Malaysia was established in 1963 as a result of the combination of Malaya (independent in 1957), the former British Singapore, Sabah, and Sarawak. In 1965, Singapore was separated from Malaysia. Since then, there is a growing improvement in housing development in Malaysia and many mega projects have been completed like the Kuala Lumpur International Airport (KLIA), Penang Bridge etc.

Table 2.1 shows the population by age group from 1963 to 2008 in Malaysia. House buyers in Malaysia, from 18 to 65 years old, can make loans to buy houses. Based on this table, in 2008, there are 17, 620 200 people can be categorized within the age group of 15 to 64 years old. This means that a lot of potential buyers in Malaysia could be involved in housing scheme and loan programs. Every year this age group grows by 380,000 people and this scenario shows that developers need to prepare themselves with knowledge in building houses that can gratify the potential house

buyers. The developers need to study their customers' needs and plan how to create the best products in the market.

Table 2.1 Population by Age Group, Malaysia, 1963-2008

Year	Group of Age (year)			
	Total	0-14	15-64	65+
1963	8,920.2	-	-	-
1964	9,168.4	-	-	-
1965	9,436.6	-	-	-
1966	9,732.8	-	-	-
1967	10,007.4	-	-	-
1968	10,252.8	-	-	-
1969	10,500.2	-	-	-
1970	10,881.8	4,847.3	5,677.6	356.8
1971	11,159.7	4,907.0	5,876.4	376.3
1972	11,441.3	4,975.1	6,076.9	389.3
1973	11,719.8	5,037.5	6,276.0	406.3
1974	12,001.3	5,100.3	6,477.0	424.0
1975	12,300.3	5,170.5	6,686.9	442.9
1976	12,588.1	5,229.1	6,903.3	455.8
1977	12,901.1	5,302.3	7,135.8	463.0
1978	13,200.2	5,365.1	7,361.2	473.9
1979	13,518.3	5,435.7	7,596.4	486.1
1980	13,879.2	5,542.4	7,845.7	491.1
1981	14,256.9	5,621.9	8,126.2	508.8
1982	14,651.1	5,723.7	8,400.4	527.0
1983	15,048.2	5,818.8	8,686.1	543.3
1984	15,450.4	5,933.9	8,957.2	559.3
1985	15,882.7	6,081.2	9,227.3	574.2
1986	16,329.4	6,223.5	9,514.8	591.2
1987	16,773.5	6,370.0	9,794.6	608.8
1988	17,219.1	6,512.0	10,080.7	626.3
1989	17,662.1	6,650.0	10,369.5	642.5
1990	18,102.4	6,775.0	10,669.0	658.5
1991	18,547.2	6,899.9	10,971.5	675.9
1992	19,067.5	7,038.6	11,322.1	706.7
1993	19,601.5	7,192.0	11,680.6	728.9
1994	20,141.7	7,329.2	12,058.4	754.1
1995	20,681.8	7,453.3	12,447.7	780.7
1996	21,222.6	7,566.1	12,850.5	806.1
1997	21,769.3	7,688.7	13,266.5	834.1
1998	22,333.5	7,781.8	13,688.7	863.0
1999	22,909.5	7,885.6	14,129.1	894.8
2000	23,494.9	8,003.1	14,560.0	931.8
2001	24,012.9	8,112.4	14,940.2	960.3
2002	24,526.5	8,214.2	15,318.5	993.9
2003	25,048.3	8,313.7	15,702.4	1,032.2
2004	25,580.9	8,415.7	16,090.8	1,074.4
2005	26,127.7	8,525.3	16,483.0	1,119.4
2006	26,640.2	8,632.0	16,858.6	1,149.6

Table 2.1 “Continued”

2007	27,173.6	8,748.6	17,237.9	1,187.0
2008	27,728.7	8,876.2	17,620.2	1,232.3
Notes:				
1. 1963-1969: Vital statistic time series, Malaysia 1963-1998				
2. 1970-1979: Based on intercensal population estimates 1971-1979				
3. 1980-1990: Based on intercensal population estimates 1981-1990				
4. 1991-1999: Based on intercensal population estimates 1992-1999				
5. 2000-2008: Based on population census 2000 (adjusted)				
6. The added total may be differ due to rounding				

Source: (Statistic, 2008)

Adams (1984) defines housing development as the activity of supplying houses, apartments, flat and other shelters as the usual residences for persons, families, and households. Houses become homes in the last process of housing development. A house becomes a home when it has occupants. Developments of houses in Malaysia should focus on gratifying the requirements of all citizens. However, normally, the developers do not ask directly about the needs of their buyers. They just develop their houses based on their hunches. According to Harriss and Arku (2006) in the 1950s, the housing expenditure could be seen as a drag in terms of growth. Nowadays it is at least in principle and seen as integral to the process of development. Housing development is very important for developing countries to make sure that their economics could grow fast.

Housing development is considered very important as it plays a huge role in the country development. A housing developer is the leader in housing development and is defined as the person or company that makes money from buying land, building new houses, shops or offices, or by changing existing building so that they can be sold or rented for profit (Cambridge, 1995). Sufian and Rahman (2008) stated that housing developers in Malaysia can be categorized into three categories which are

private developers, statutory bodies and co-operative societies. However, whenever the developers develop more than four units of housing accommodation they will be governed by the Housing Development (Control and Licensing) Act 1966 (HDA).

Housing act in Malaysia was developed in 1966 and since then, housing schemes become a serious agenda. Every year housing development in Malaysia has been increased but the developed houses are still not enough to balance out the increasing population. Table 2.2 shows the summary for the supply of residential units by type in Malaysia. The table demonstrates that 2-3 storey terraced houses are the most prevalent type of houses in the existing stock and they are followed by single storey terraced houses. In the third quarter of 2009, Selangor has the highest existing stock with 1,234,147 units and it is followed by Johor with 658,511 units. Selangor and Johor have a difference for the highest type of house. In Selangor the highest type is a 2-3 storey terraced house and it is followed by low cost flat. In Johor, the highest type of house is a single storey terraced house and it is followed by 2-3 storey terraced house. For Pulau Pinang, the highest type of house in the existing stock is flat house with 105,831 units and it is followed by low cost flat house with 52,042 units.

Table 2.2 Summary of Supply of Residential Units by Type in Malaysia, Source: (JPPH, 2009)

Review Period	Satates	Single Storey	2-3 Storey Terraced	Single Storey Semi-Detached	2-3 Storey Semi-Detached	Detached	Town House	Cluster	Low Cost House	Low Cost Flat	Flat	Service Apartment	Condominium/ Apartment	SOHO	Total
EXISTING STOCK															
Q2 2009	WP Kuala Lumpur	22,210	66,864	636	5,568	7,928	4,732	4,248	4,360	89,023	48,263	7,407	133,473	0	394,802
	WP Putrajaya	0	978	0	269	81	96	0	0	0	2,538	0	0	0	3,962
	WP Labuan	591	755	70	858	5,255	11	0	874	680	1,300	0	308	0	10,702
	Selangor	147,246	375,376	8,600	24,882	42,776	9,603	5,505	87,033	186,705	147,190	10,412	183,127	0	1,228,455
	Johor	172,693	139,718	25,468	14,350	84,622	1,165	1,886	123,580	44,377	19,374	3,292	25,043	0	655,568
	Pulau Pinang	40,920	51,100	8,564	13,805	6,168	1,851	7,521	14,122	51,942	105,063	513	34,511	0	336,080
	Perak	115,193	77,233	16,335	9,066	59,472	362	394	78,826	7,834	2,632	1,259	4,295	0	372,901
	Negeri Sembilan	77,734	33,440	9,440	3,553	30,616	1,064	1,665	35,478	10,451	6,373	5,408	13,523	0	228,745
	Melaka	47,737	26,447	4,997	3,088	12,163	3,092	888	28,107	5,959	6,073	345	10,359	0	149,255
	Kedah	60,025	20,477	32,277	9,873	34,726	576	460	83,971	4,135	1,272	748	734	0	249,274
	Pahang	44,404	21,810	12,500	3,225	66,118	181	0	41,281	3,868	2,589	647	7,479	0	204,102
	Terengganu	11,250	4,134	4,909	1,369	9,958	0	0	13,460	3,120	1,176	0	689	0	50,065
	Kelantan	17,367	5,025	2,571	905	15,883	0	800	9,602	514	436	0	778	0	53,881
	Perlis	6,274	1,146	2,692	599	520	0	42	7,326	1,378	96	0	96	0	20,169
	Sabah	16,785	33,511	2,833	9,761	7,073	263	804	13,987	18,970	8,020	904	17,909	0	130,820
	Sarawak	33,038	47,093	9,966	27,121	13,559	118	1,088	27,690	13,728	2,497	128	9,868	0	185,894
	MALAYSIA	813,467	905,107	141,858	128,382	396,918	23,114	25,301	569,697	442,684	354,892	31,063	442,192	0	4,274,675
Q3 2009 ^P	WP Kuala Lumpur	22,210	66,864	636	5,658	7,928	4,732	4,248	4,360	89,023	48,263	7,719	134,390	0	396,031
	WP Putrajaya	0	978	0	269	83	96	0	0	0	2,538	0	0	0	3,962
	WP Labuan	645	772	70	876	5,255	11	0	874	680	1,300	0	308	0	10,702
	Selangor	147,467	378,561	8,628	25,515	42,987	9,915	5,569	87,365	187,233	147,190	10,412	183,127	0	1,228,455
	Johor	173,129	140,389	25,502	14,737	84,639	1,165	2,010	123,641	44,531	19,552	3,292	25,043	0	655,568
	Pulau Pinang	41,009	51,835	8,564	13,909	6,219	2,063	7,521	14,534	52,042	105,831	513	34,511	0	336,080
	Perak	115,872	78,248	16,483	9,198	59,499	362	418	78,887	7,834	2,632	3,292	4,295	0	372,901
	Negeri Sembilan	78,049	34,368	9,657	3,601	30,830	1,064	1,777	35,493	10,451	6,373	5,408	13,523	0	228,745
	Melaka	47,804	26,580	5,051	3,108	12,167	3,092	888	28,107	5,959	6,073	345	10,359	0	149,255
	Kedah	60,591	20,712	32,481	9,873	34,747	576	508	84,295	4,135	1,272	748	734	0	249,274
	Pahang	44,625	21,960	12,770	3,257	66,137	181	0	41,281	3,868	2,589	647	7,479	0	204,102
	Terengganu	11,346	4,174	4,980	1,377	10,128	0	0	13,499	3,120	1,176	1,259	689	0	50,065
	Kelantan	17,479	5,111	2,589	905	15,939	0	800	9,602	514	436	0	778	0	53,881
	Perlis	6,339	1,146	2,752	599	522	0	42	7,338	1,378	96	0	96	0	20,169
	Sabah	16,785	33,941	2,833	9,913	7,073	263	804	13,987	18,970	8,020	5,408	17,909	0	130,820
	Sarawak	33,327	47,530	9,992	27,239	13,561	118	1,088	27,734	13,728	2,497	128	9,868	0	185,894
	MALAYSIA	816,677	913,176	142,988	130,034	397,714	23,638	25,673	570,997	443,466	355,838	345	442,192	0	4,274,675
												778	0	0	54,153

												128	96	0	20,308
												31,375	17,981	0	131,474
													9,868	0	186,810
													444,354	0	4,295,930
COMPLETIONS															
Q2 2009	WP Kuala Lumpur	0	0	0	8	5	0	0	0	0	0	446	669	0	1,128
	WP Putrajaya	0	85	0	0	0	0	0	0	0	0	0	0	0	85
	WP Labuan	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Selangor	333	2,835	82	220	111	141	476	0	506	506	1,087	1,392	0	7,743
	Johor	2,044	1,487	114	34	9	0	272	79	24	116	0	0	0	4,179
	Pulau Pinang	14	942	0	268	3	0	8	0	380	3,061	0	168	0	4,844
	Perak	957	1,968	254	242	63	0	84	391	0	0	0	0	0	3,959
	Negeri Sembilan	126	249	0	29	112	0	0	0	0	0	0	0	0	516
	Melaka	156	23	44	20	0	0	0	108	0	0	0	0	0	351
	Kedah	326	529	592	99	130	0	0	30	0	0	0	104	0	1,810
	Pahang	144	285	242	20	3	0	0	41	0	0	0	0	0	735
	Terengganu	94	64	58	30	222	0	0	45	0	0	0	0	0	513
	Kelantan	167	35	26	2	34	0	0	0	0	0	0	0	0	264
	Perlis	18	40	26	0	8	0	0	0	0	0	0	0	0	92
	Sabah	109	439	8	50	5	0	0	0	700	128	0	96	0	1,535
	Sarawak	514	312	58	68	2	0	0	51	0	0	0	244	0	1,249
	MALAYSIA	5,002	9,293	1,504	1,090	707	141	840	745	1,610	3,865	1,533	2,673	0	29,003
P – Preliminary															

Housing development in Malaysia has gone through the process of evolution through which the development has changed from small scale to large scale. There is indeed an obvious growth in housing development in general. However, the development of green homes is still considered new- only some developers in Malaysia has practiced the concepts of green homes by developing solar powered homes, and creating small gardens in housing and etc. Housing developers still do not know the most suitable criteria for house buyers to implement the green home concepts in Malaysia.

2.2.1 Process of Housing Development in Malaysia

Housing development process in Malaysia has been standardized. Figure 2.1 presents the flowchart for property development. However, there is no clear guideline in the process of building green buildings. The housing development process needs to go through five departments namely Land Office, Local Authority Planning Department, Local Authority Building Department, Local Authority Engineering Department and Technical Department to make sure the standards are followed.

Figure 2.2 presents the application for conversion and subdivision in housing development. Land Office focuses on land law and the process of application for conversion and subdivision. Applications need 48 days to be completed. Figures 2.3 to 2.6 show that the planning permission application involves the Local Authority Planning Department. In this department, Act 172 is used to consider the applications. However, there is no clear guideline can be followed in this Act. It takes 84 days for this department to process applications in most cases. Yet, in some cases where local plans are available, it only takes about 33 days.

Figure 2.4 shows the building plans and application for housing development. The approval of building plans lies on the hands of local authority where the local authority shall ensure that the applicant-developer has complied with all necessary rules and regulations, in particular the Uniform Building by Law (UBBL). For the housing development that involves low cost units, building plans submitted for approval have to be in compliance with (Construction Industry) CIS 1 or CIS 2 after checked by the local authority. The local authority has the power to make sure that the building plan is submitted by a qualified person. That qualified person could be an architect or in some cases a house detective and the local authority has the complete power to act against them (Sufian and Rahman, 2008). It is within the power of the local authority to ascertain that a building plan is submitted by a qualified person. Based on Law 5 of the UBBL, the qualified person who has submitted and certified the plans and specifications for building approval, and been issued the Certified of Completion and Compliance (CCC) has the responsibility to supervise the construction work until its completion. In addition, in Section 70 Act 133, (street, drainage and building act) (including sanitary plan and reinforced concrete plan) has been used in the building plan application. Usually the application needs 50 days to be processed but if local plans are available, it only needs 25 days. Figure 2.5 presents the road and drainage plan applications with Section 9, Act 133 (street, drainage and building act) and Section 70A act 133 (street light plan act) being implemented. 25 days are needed to complete the applications if local plans are available. Lastly, in terms of technical issues, a list of technical departments are listed in figure 2.6.

These flow charts do not show the green building concepts that need to be considered by developers during the development approval process. The development approval process is crucial because during it, the government could encourage developers to consider some green home aspects in the housing development.

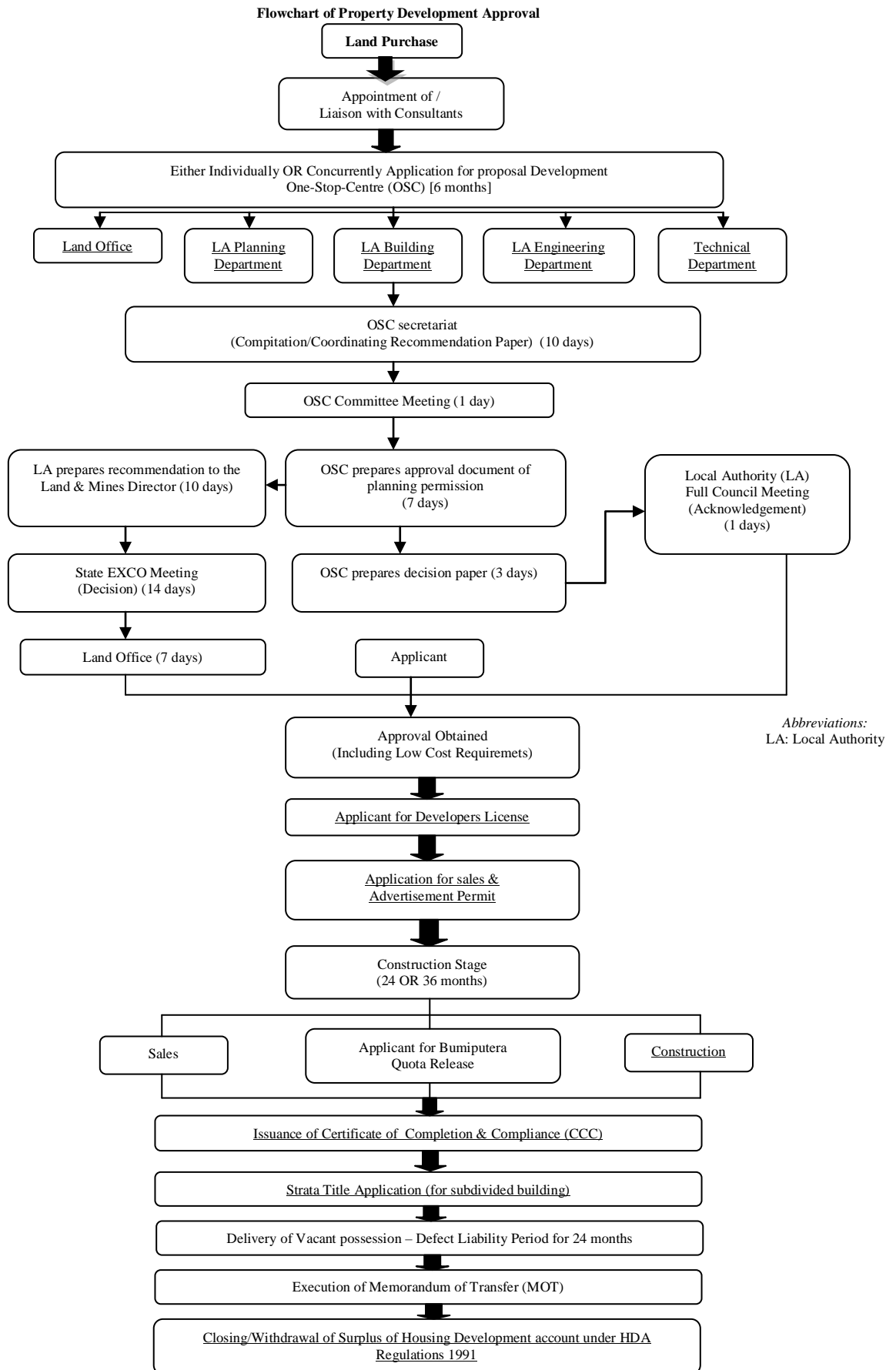


Figure 2.1 Flowchart of Property Development Approval
Source (REHDA, 2009)

**APPLICATION FOR CONVERSION &
SUBDIVISION**

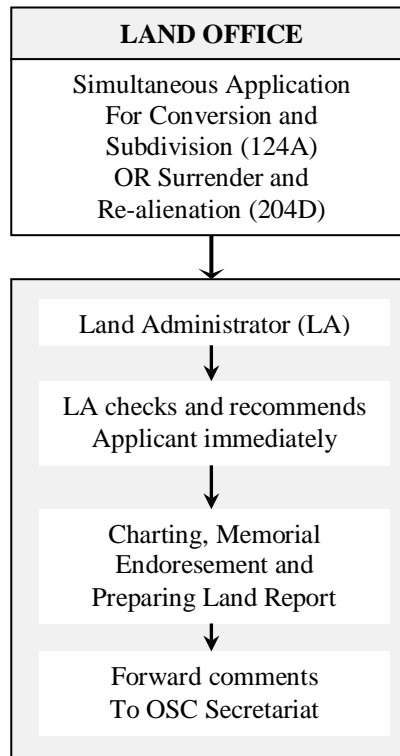


Figure 2.2 Applications for Conversion and Subdivision
Sources (REHDA, 2009)

PLANNING PERMISSION APPLICATION

LOCAL AUTHORITY PLANNING DEPARTMENT

Planning Permission Application
(Subsection 21(1), Act 172: Town & Country Planning Act)
(Including landscape Plan, Proposal of housing Scheme Name
Plan and Proposal of Road Name Plan)**

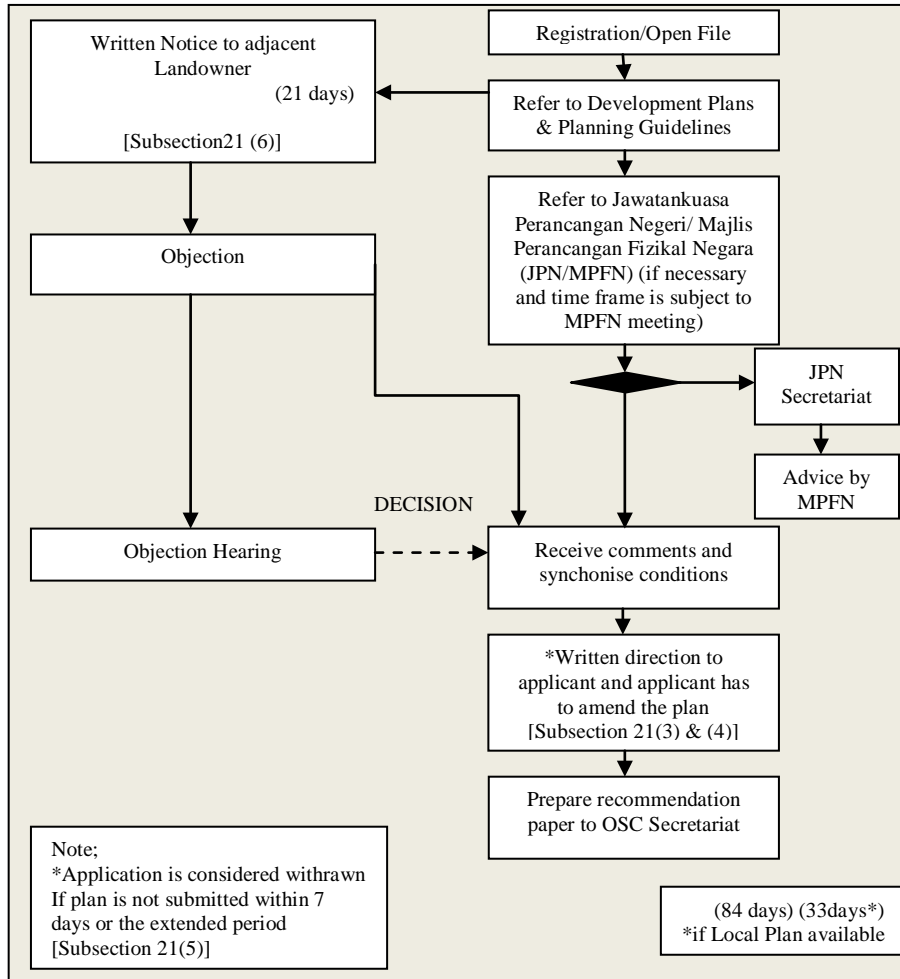


Figure 2.3 Planning Permission Applications
Sources (REHDA, 2009)