TOWARDS THE IMPLEMENTATION OF SUSTAINABLE HOUSING IN MALAYSIA : AWARENESS AND READINESS ASSESSMENT FRAMEWORK

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ABSTRACT : The concept of sustainability has become the keystone of the global dialogue about the human future in every facets of human life. However, it is still a difficult concept for many to fully understand; locally or globally. What exactly do we intend to sustain and what will that require of us? The questions arise are what hinder the stakeholders to play their parts in sustainable housing even though the concept has been introduced two decades ago, to what extent do stakeholders aware of this concept and idea, and how far they are ready to take serious parts to work cooperatively towards achieving the objectives as stipulated in Agenda 21 which the overall human settlement objective is to improve the social, economic and environmental quality of human settlements and the living and working environments of all people, in particular the urban and rural poor. This paper attempts to specifically clarify the concept of sustainable development and the relationship between sustainability and housing. It will also try to review existing papers and housing projects from different countries on the said subject. The review will be used as a base to look further into Malaysia's situation, its implication and approach to be taken towards the stakeholders. Subsequently, this study will help to improve guideline for effective implementation of sustainable housing in Malaysia.

Keywords : sustainable development, sustainable housing, sustainability awareness, awareness study, readiness study, housing in Malaysia

1.0 INTRODUCTION

Do we like the home in which we live today? Are we satisfied with the design of our neighbourhood, the level of noise, pollution, transport and availability of green space? Architect John Koh, the immediate past president of the Eastern Regional Organisation of Housing and Planning, and now FRAIA International Committee Member and the managing director of Arkitek Maju Bina Sdn. Bhd. believes that our homes, neighbourhood, the city and the environment we live in are simply not sustainable places. A sustainable building is a structure that is designed, built, renovated, operated or reused in a resource-efficient manner; in a way that will not compromise the health of the environment or the well-being of

the building's occupants, construction workers, the general public or future generations. What we have now does not quite fit that statement. The ordinary Malaysian will tell you that he is confronted by so many unresolved sustainability issues. These ranges from non-availability of cheap and safe drinking water, increasing cost of energy and the lack of affordable homes to growing problems of pollution, environmental degradation in neighbourhoods and security concerns in the suburbs and cities. There are also unsustainable planning issues like inadequate structure plans with little follow-up in local plans and weak environmental impact assessments. Examples are suburban sprawls, urban slums and traffic snarls in towns and cities that cause the one-way street solution to become a feature of so many Malaysian towns today. The issues are also about the inadequate development planning and enforcement of safety and health guidelines, as well as the unbridled development of golf courses for the few at the expense of public recreational parks and affordable housing needed by many. However, according to Koh, the blame does not rest entirely with the authorities. In a lot of ways the public is to be blamed. The public do not seem to be aware of what they are buying (Sunday Times, Building and living responsibly in the city, 19 June 2005).

Ministry of Housing and Local Government has taken initiative to implement The Local Agenda 21 Pilot Project with support from the United Nations Development Programme (UNDP) and in co-operation with the Economic Planning Unit (EPU) of the Prime Minister's Department. Local Agenda 21 (LA21) is a program to forge partnerships between local authorities (such as District Councils, Municipal Councils, City Councils and City Halls) and the communities they serve as well as the private sector to work together to plan and care for their surroundings towards sustainable development and a better quality of life. Through LA21 the three parties will identify and analyse local sustainable development issues, and then formulate and implement action plans to address them (Official website of ‘Kementerian Perumahan dan Kerajaan Tempatan’). However, the Kanagawa meeting, held in August 2000 in Kitakyushu City, Japan, noted that while it is true that many local governments in Asia have taken serious effort to implement their own Local Agenda 21, the state of the environment and the degree of sustainable development achieved so far “has not sufficiently improved”. In fact, in several aspects, the situation had worsened (New Straits Time, Walking the Kanagawa Talk, 27 May 2006).

Although no remarkable achievement of sustainable building and housing in Malaysia, there are still few property developers who have made the move and take the initiative to lead the industry to sustainable building practices. One of them is Sunrise Berhad, renowned for the beautiful development of Mont' Kiara. It's 11@Mont' Kiara (MK11) condominium development recently became the first residential development in Malaysia to receive the Building and Construction Authority (BCA) of Singapore's Green Mark Certified Award. Sunrise assistant general manager of development, Raymond Cheah said that the company's future projects would reduce the impact on the environment, improve indoor air quality, utilise innovative technology and promote efficient use of energy and water. Sunrise is promoting a culture of sustainable building practices in Malaysia to ensure a balanced quality of life that blends the environment into the built structures as an integral part of community living (The Star Online, Sunrise Green Initiative, 27 September 2008).

The BCA Green Mark scheme is a green building rating system to evaluate a building for its environmental impact and performance. The concern is that while some countries in the region like India, Singapore and Australia have developed their own Green Building Councils and Rating Standards derived from the LEED in the US, Malaysia is still in the process of forming a Green Building Council, while even countries like Vietnam have taken a lead. Umang Sharma, CEO of Bry-Air, a global leader in air engineering and environmental control technologies expressed the need of Malaysia to hasten the process to catch up with the world as many countries have gone further and are already working on the next stage 'Net Zero Energy' buildings (The Star online, Green Building, 7 September 2008).

On the other hand, sustainability of a city in Malaysia is still hard to measure as there are no criteria or measurement tool for urban sustainability. What are available and similar to sustainability indicators are standards for various sectors that were produced by technical departments. The latest being the Malaysian Quality of Life Report, 1999, published by the EPU, where the indicators for 10 fields where used to formulate indexes that portray the quality of life level in Malaysia. The Federal Department of Town and Country Planning Peninsular Malaysia has formulated 55 urban indicators to measure the minimum quality of life standard that has to be achieved by each city in the country. To simplify the usage of these indicators, a standard system for a sustainable city evaluation

has been set up in 1997 known as Malaysia Urban Indicators Network Programme (MURNInet). It is a computer system that analyses current urban conditions and effects of development, surveys temporal change and formulate sustainable urban scenarios for the future based on fixed standards. Those standards are the 11sustainable development components including housing, recreational and welfare facilities, environment, heritage and tourism. Once a city's sustainability had been evaluated, relevant guidelines to upgrade its sustainability, quality of life and surroundings would be outlined

In this study, the assessment will be done towards the players or stakeholders in the construction and housing industry. Stakeholders are those people, groups or institutions who have specific rights and interests in an issue of system, and related powers, knowledge and skills (Clayton and Bass, 2002). In such sense, stakeholders may cover a wide range of groups of people and it is impossible and impractical to involve all the stakeholders into analysis. Therefore, primary stakeholders who will be chosen considering that those who are likely to be affected by the issue or a potential response to it, either positively or negatively, are identifies as follows:

1. Public sector – local authority
    i) There are 148 local authorities throughout the country
2. Private sector – housing developers and contractors
    i) 727 housing developers (Yellowpages)
    ii) Contractors' registration by category as of September 2006 (CIDB Construction Quarterly Statistical Bulletin, Third Quarter 2006) : building construction (61,188), civil engineering construction (58,983), mechanical and electrical (11,040)
3. Construction professionals – architects, quantity surveyors and planners
    i) There are 1672 registered members (architects) of LAM
4. Malaysian public - housing customers
    i) Malaysia's population is expected to increase from 27.17 million in 2007 to 28.96 million in 2010. The median age of Malaysians is 27.4 years. In 2007, a total of 63.4% of the total population consisted of those in the working age group between 15 and 64. The Government expects that 63.8% of the population would be living in urban areas, resulting in a higher demand for more houses, schools and employment. In recent years, proportion of total potential buyers grew from 36.9% in 2002 to 39.1% in 2007, underpinned by the increase in

the age groups of between 40-49 and 50-59 at a 5-year CAGR of 2.7% and 5.4% respectively, in 2007 (The Star Online, Saturday April 19, 2008)

ii) During the period of the 1991-1995 (GOM 1991) 573,000 units of new houses were planned, and 647,460 units were built. The private sector built a total of 562718 units. A total of 386,074 units medium and high cost houses were completed, giving a 168.4 per cent achievement from the target. In contrast a total of 261,386 units of low cost house were completed, giving about 76.0 per cent achievement from the target. From the total units of low cost houses completed, the private sector contributed 214,889 units. In addition, 131,325 units of houses were built under the special low cost housing scheme, in which the public sector built 46,497 houses (i.e. 36.7 per cent from target, the rest was constructed by state governments and by the various government agencies).

iii) Residential market increased to 22,185 units in the 1st half of 2006 from 15,083 units in the same period a year earlier (Asia property report)

This paper attempts to specifically clarify the concept of sustainable development, sustainable housing and the relationship between sustainability and housing. It will also try to review existing papers and housing projects from different countries on the said subject. The review will be used as a base to look further into Malaysia's situation, its implication and approach to be taken towards the stakeholders. Subsequently, this study will help to improve guideline for effective implementation of sustainable housing in Malaysia.

2.0 PROBLEM STATEMENT

Housing provision for all in any country is very crucial in order to ensure social-economic stability and to promote national development (Syafiee, 2005). And it is also one of the significant factors of all national economies. On the micro level, it has been observed that house ownership is one of the first priorities for most households and it represents the largest single investment for most.

Although the quality of life and the standard of living for the Malaysia's residents especially in the city have improved, the increase in population and their

demands for a better life have exerted unprecedented pressures on the transportation network, housing and provision of basic amenities and despite all the efforts at providing the people with appropriate housing the urban managers have to find solutions to squatter settlements which seem to have increased in number in urban areas especially in the states that are still undergoing fast urbanisation such as Sabah and Sarawak and in the major urban areas. (Lestari, 1997).

3.0 RESEARCH QUESTIONS

Based on the problems stated above, three main questions are formed as below:

a. What are issues and problems faced by stakeholders pertaining to the sustainable housing in Malaysia and which impede the implementation of sustainable housing practices?
b. What is the level of awareness of the stakeholders on the sustainable housing concept?
c. What is the level of readiness of the Malaysian public to start demanding for sustainable homes and the other stakeholders to implement the sustainable housing concept and knowledge in their work fields?

4.0 RESEARCH OBJECTIVES

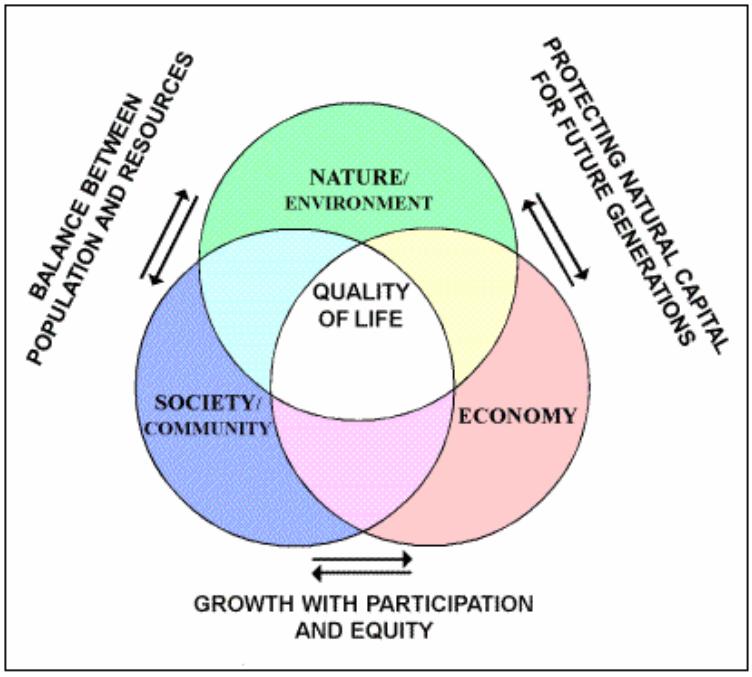
There are four objectives of this study:

a. To highlight issues and problems related to the importance of the implementation of sustainable housing in Malaysia
b. To highlight the level of awareness of sustainable housing concept among the stakeholders.
c. To highlight the level of readiness of sustainable housing implementation among the stakeholders.

5.0 SUSTAINABILITY CONCEPT

Sustainable development is not really a new idea. Many cultures over the course of human history have recognized the need for the harmony between the environment, society and economy. What is new is an articulation of these ideas in the context of global industrial and information society. Sustainable development first emerged as a mainstream concept with the publication of the

United Nations World Commission on Environment and Development (WCED) report entitled Our Common Future in 1987. The publication, more commonly called the Brundtland Report, provided the still most commonly used definition of sustainable development that is *"development which meets the needs of the present without compromising the ability of future generations to meet their own needs"* (WCED, 1987, 8). Interest in and support for sustainable development continued to grow with the publication of Agenda 21, following the Earth Summit in Rio de Janeiro in 1992. This document called for communities worldwide to develop their own sustainability plans and for individuals to incorporate sustainable practices into their daily lives. Relative to human settlements, Agenda 21 set forth an objective *"to improve the social, economic* and environmental quality of human settlements and the living and working environments of all, and particularly the urban and rural poor'' (Robinson, Hassan, & Burhenn-Guilmin, 1992, 158).



Source: Schively, 2006

Figure 1 : Sustainable Development Issues in Agenda 21

The concept of sustainability has become the keystone of the global dialogue about the human future in every facets of human life. The related concepts of sustainable development and sustainability are integral to sustainable housing and it closely related to green building or sustainable building concept and few other sustainable concepts such as sustainable construction and sustainable design.

6.0 SUSTAINABLE HOUSING AND ITS EXAMPLES

Sustainable housing principles guide the use of structural designs, building products, domestic appliances and electronic devices in a way that minimises energy resource use, prolongs the life of the house, and improves liveability for residents. Sustainable housing can significantly contribute to reducing greenhouse gas emissions, urban air pollutants, water demand, materials' use, waste and land degradation (ISF 2003), with Australian research demonstrating that energy efficient homes produce 70% less greenhouse gas emissions per year than an average family home (Tweed Shire Council 2002).

According to Stevenson & Williams (2000), housing can contribute to sustainability by the following ways:

1. Minimising climate change

The most widespread and potentially damaging environmental problem at present is global climate change as a result of the emission of greenhouse gases, notably CO_2. As a result of the Kyoto Protocol, which is an agreement made under the United Nations Framework Convention on Climate Change (UNFCCC), Malaysia has agreed to a legally binding international commitment to reducing their emissions of carbon dioxide and five other greenhouse gases (GHG), or engaging in emissions trading if they maintain or increase emissions of these green house gases. In Malaysia, about 25% of the CO_2 emissions in 1999 come from the residential, manufacturing and construction sector. The housing sector also has an important role to play, both in terms of dwelling characteristics and the structure and location of residential developments. Housing consumes large quantities of energy in its production and use, for example the UK as the case, Scotland in particular:

- between 40 and 50% of UK CO_2 emissions are attributable to buildings, two thirds of this to the domestic sector
- 10 per cent of UK CO_2 emissions are due to embodied energy used in the construction process
- Scottish housing emits 17.8 million tonnes of CO_2 per annum, an average of 8.5 tonnes per dwelling.

2. Reducing the need for physical resources

Improvements in the way we design and build our dwellings offer opportunities to use materials more sparingly. At the end of a building's life, recycling and re-use would reduce the need for quarrying and other source activities and also the amount of landfill required on demolition. Again we look at Scotland as the example, only one per cent of construction material is re-used and there are large sustainability gains to be made in terms of resource consumption and environmental impact through better practice. This includes refurbishment of existing buildings as well as greater use of recycled and re-used materials.

3. Reducing pollution and improving air quality and health

In addition to greenhouse gases energy use in the home produces other gases which have negative effects. These include SO_2 (which causes acid rain), NOx and CO (which are poisonous). Greater levels of energy efficiency will reduce the output of these pollutants. A combination of more airtight buildings and the increasing use of synthetic materials have resulted in a collection of ill health effects known as sick building syndrome resulting from indoor air pollution. These include headaches, nausea, eye and skin irritations and breathing difficulties. Careful choice of building materials can boost the use of renewable resources which reduces pollution levels both indoors and outdoors.

4. Creating sustainable settlements

The single biggest source of greenhouse gases is the transport sector and these particular emissions can be significantly reduced by planning and building in such a way that travel is reduced, and where necessary can be achieved by walking, cycling or public transport. Housing should be located close to employment and services and also to public transport. The co-operation of housing developers, land use planners and transport planners will be crucial to ensure that we build in such a way that accessibility is maximised and car dependency minimised. This will mean departing from old conventional wisdoms about the form of the built environment; building at higher densities will be preferable to lower densities and mixed land uses will be preferred to single use zoning. More effective use can also be made of land and building resources by refurbishing existing buildings (including non-residential buildings) for new dwellings where this is cost effective.

Stevenson & Williams (2000) also highlighted how they perceived sustainable development to benefit housing. This is a two-way process because the most cost-effective way to develop and maintain a high quality housing stock in the long term is to incorporate principles of sustainability into all parts of the housing development process. Since new build comprises only a small fraction of the existing stock it is also important that refurbishment incorporates sustainability principles. Followings are points that have been highlighted by the authors:

1. Energy efficiency

Higher energy efficiency can make a significant difference to quality of life, health and material standard of living, especially to poor households. For example we look at the case of Scotland, many Scottish households cannot afford to heat their houses properly, or go without other essentials to do so. A quarter of Scottish dwellings suffer from condensation or dampness, in part because of inadequate heating. This has well established harmful effects on health and imposes an additional burden on deprived households. The improvement of domestic energy efficiency for lower income households can potentially enable them to heat their homes to a higher standard, reduce condensation and dampness, and release income for other purposes. It can make significant contributions to enhanced health and reduced poverty.

2. Social inclusion

A sustainable housing development would not only have environment friendly and energy efficient buildings, it would also have access to employment, schools, shops, places of entertainment, primary health care, and it would be accessible by public transport. It would also be mixed in terms of tenures, incomes and age groups. For a house to be a home it must be geographically located such that its inhabitants can use it as a base from which to enter society at large; it must facilitate social inclusion and not be a mechanism of social exclusion. Scale is an important dimension of sustainability. Housing developments should not be so large that they alienate the people who live in them. Residents should be given the opportunity to take responsibility for their environment whether they are tenants or owner occupiers, and this is only possible when they live in developments or management units which are small

enough for this to be practicable. Residential development which is designed to contribute to sustainability will provide not only warm, dry and healthy homes and reduce the need to travel, but also a setting which enhances quality of life from generation to generation and which integrates people into society at large. It will maximise the effectiveness of housing investment and be crucial to the building of cohesive communities.

3. Value for money and economic effectiveness

Making economies in the short term can often lead to poor value for money in the long term. Building cheaply may produce more dwellings for money spent, but in the long term may cost more. The essence of sustainability is a consideration of long term costs and benefits. Residential development according to sustainability principles may cost more in the short term, but will have a significant downward effect on overall, long term costs. Extra expenditure on energy efficiency, for example, may increase capital costs but there is evidence that in the long term the savings in running costs will exceed the initial extra capital costs. There is also evidence that building to a high environmental specification leads to lower maintenance and management costs. Whole life costing can be used to estimate long term costs and allocate them to different people and agencies (landlord, tenant, developer).

People's housing needs change as they age. It makes sense to produce homes which have flexible physical structures so that they can be adapted to changing uses over time. This may mean that people can stay in their homes longer, or that dwellings and residential areas generally can house different people over time. Planning for the long term - planning for sustainability - can increase the flexibility and effectiveness of the housing stock and lower long term costs.

Unfortunately, a stigma attached to sustainable housing has inhibited the uptake of eco-friendly, smart housing designs and products (Department of Industry, Technology & Commerce, [DITC] 1991). Smart housing incorporates the aims of triple bottom accounting, a method of reporting environmental, social and economic responses to sustainability criteria (Elkington 1999). Nevertheless, smart housing, perceived primarily as a 'green' response to environmental sustainability, is often associated with alternative lifestyles (DITC 1991; Minnery

et al. 2003), with research indicating that many consumers fear that if they build a sustainable house there will be little resale appeal. One of the drawbacks to mainstreaming ecologically sustainable housing designs is consumer resistance, based on perceptions of eco- or green- housing as being less aesthetically pleasing, and less economically attractive for resale than traditional housing (Minnery et al. 2003).

According to Baum and Wulff (2001), attitudes to housing in Australia are strongly linked to the notion that traditional housing provides status, functionality, and economic security, an integral part of the Australian lifestyle and cultural identity; consumers are, understandably, wary of changes that may undermine the large economic investment they make in a house (DITC 1991). Not surprisingly, then, the first demonstration green home, built in Melbourne by the Australian Conservation Foundation in 1993, did not successfully convince consumers of its value, and for a variety of reasons related to design and pricing, failed to sell at auction (Okraglik & Pollard 1995).

Karen Kho, an urban planner for the Green Building Program (GBP) in Alameda County California stated that the public is not asking for green building yet. It's probably due to the lack of information, but also the housing shortage in California. Consumers have not been picky about what they buy, at least not recently (Reams, 2006).

WHAT →	**WHO** →	**WHY** →	**HOW**
What is being buit?	*Who is building?*	*What do they value?*	*What influences them?*
Mass-Prroduced Homes & Apartments	Production Builders, Developers, Contractors	Profit, Predictability	Consistent, Standards Expedited Processing
Custom Homes & Home Remodels	Custom Builders, Remodelers, Architects	Status, Performance, Individuality	Awards, Ratings, Information
Affordable Housing	Non-Profit Developers, Architects	Social Equity, Environment	Regulations, Financing, Information
Custom Green Homes Eco-housing	Owner-Builders, Green Builders	Environment, Affiliation	Information

Source: Reams, 2006

Figure 2 : Result of Stakeholders Analysis

Karen Kho and the GBP team have also done a study and analysis about housing market, and in this case of green building, they concerned about what

kind of housing is being built. Firstly, the identification of the types of housing being built in a community and list them by the quantity of production. Secondly, the identification of the stakeholder groups that are building each type of housing. Thirdly, find out the values or motives of each group, and lastly, the consideration of what will influence each stakeholder group to "green" their activities. So they start with "What", then shift to "Who", then to "Why" and then to "How". The chart above shows what this analysis looks like in the United States, and for California overall. It shows that the custom builders and remodelling contractors tend to be more interested in status, performance and individual creativity as where the mass production homebuilders want profit and predictability. There would be very different motivations for these groups.

In order to build a new program of green building from scratch, the first thing to do is stakeholder analysis so that the right target groups can be identified, but the way the program will be constructed will depend on the resources and opportunities unique to the situation. What local authority chooses to focus on will depend on what kind of building is taking place in the community. The good thing is that they do not have to develop the tools and practices from scratch, as the GBP team did, but what cannot be substituted is the local groundwork of convening key stakeholders and developing shared values and motivations. Every community needs to do that for themselves.

The main elements for the implementation of green building are policies, guidelines, ratings/incentives, technical assistance/education and consumer outreach, as per chart below.

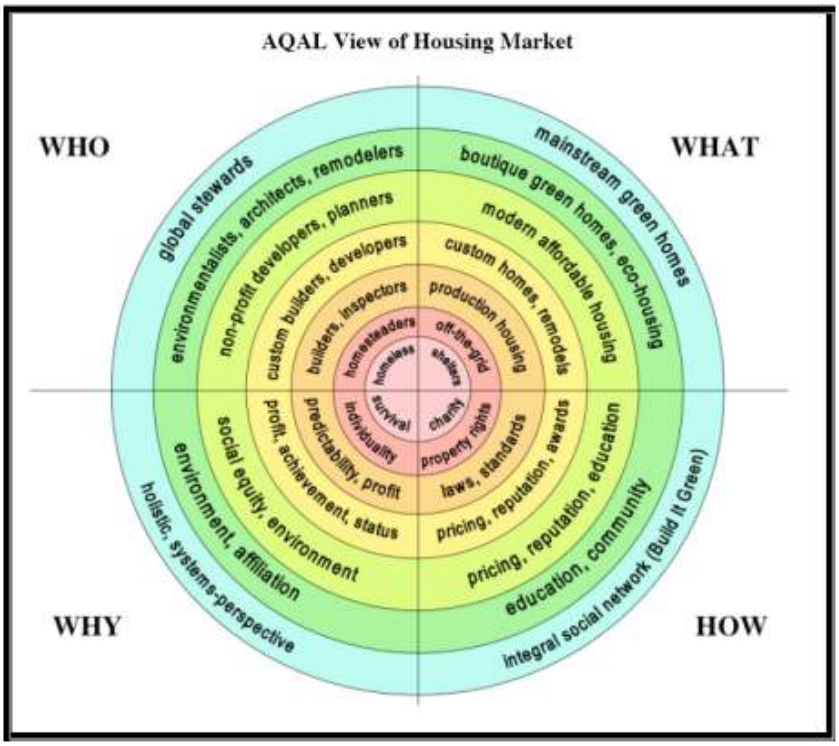
HOW →	WHY →	WHO →	WHAT
Elements	*Purpose*	*Target Audiences*	*Desired Outcome*
City Policies & Permit Process	Set standards Encourage collaboration	City Officials, Production Builders	healthy, Safer, Durable, Energy efficient, Cost-effective, Sustainable, Comfortable, Housing for All
Guidelines & Educations	Consistency How-to-information	Building Professionals, Homeowners	
Rating System & Incentives	Promote competition Reward excellence	Architects, Developers, Custom Builders	
Design Assistance & Grants	Facilitate learning Financial support	Non-profit Developers	
Consumer Marketing	Increase demand Public awareness	Homeowners, Civic Groups	

Source: Reams, 2006

Figure 3 : Residential Green Building Program Development

Based on GBP team experience working with all the cities in Alameda County (by providing recommendations on what policies the cities should adopt for the cities own buildings as well as private sector buildings), they often find themselves bridging between the cities and the builders. Builders feel that cities are over regulating everything that the builders doing and that getting a project approved costs far too much money and time. Many cities, especially the more mature ones, feel that the builders ought to be required to do more. Both have valid concerns, but they usually do not communicate in a non-adversarial way. The team often serve in an intermediary role. However, it is possible to meet multiple stakeholder needs in a way that will continue to grow in a very positive and successful way towards the implementation of sustainable housing or green building. Each of the stakeholder groups needed time to coalesce around core values, to develop their own mission statement or sense of purpose and priorities.

In addition, the graph below has been constructed to show the focus of the green building program. If we look at the middle four rings, from production housing out to the eco housing, that is where the green building program has focused.



Source: Reams, 2006

Figure 4 : AQAL View of Housing Market

That covers the market transformation program. It shows how to “green” housing in Alameda County. By looking back at the stakeholder analysis and how that led to the green building program, we will see all those different stakeholder groups and the elements of the green building program in those four rings. Then the GBP team added in the centre to rings of housing types that are “below the market” so to speak. There is no open market for those sorts of things. But they fill in the full picture of what is being built (Reams, 2006).

An excerpt from architect John Koh; a well-thought-out brief and proper site selection is the first prerequisites to sustainable design. For the hot and wet tropical weather we experience, a building's orientation towards the sun and wind is important. Designing to contours in sensitive hillside development is also necessary as are the use of local materials and techniques. Retaining existing mature trees outside the development footprint, reusing excavated boulders and landscaping to serve as shade and noise or dust filters are simple steps that make a neighbourhood a nicer place to live. On the aspect of energy and resources conservation, proper solar and wind orientation, adequate roof cover, screens and openings for thermal comfort are the first line and best energy conservation approaches. Tapping natural cross ventilation will reduce the need for air-conditioning while harvesting rain water for toilets and watering the garden could reduce the demand for expensive treated water. They do not need complicated technology and very high cost to effect. According to Koh, we could begin by adopting the 4Rs of sustainable building:

1. Reduce. Planners and developers to rethink the 22x75ft terrace lot subdivision approach. Instead, go high in urban sites to free up land for recreation and conservation, design compact units but not new slums, and select durable materials for longer service life and easier maintenance.
2. Reuse. Materials like bricks, roof tiles, timber, windows and doors left over from a renovation project can often be reused, and heritage buildings could be adapted for re-use as the Central Market building in Kuala Lumpur has been.
3. Renew. The concept of which proposes the greater use of natural energy sources like wind, sunlight and water to minimise the impact of a building on the environment and reduce those hefty electricity bills. Koh recommends working with the Japanese who have come up with remarkably affordable solar systems for space cooling.
4. Recycle. Examples abound all over the world. For example, recycled cardboards and sandbags have been used to create award-winning refugee

shelters or temporary housing in disaster zones. Koh wants to see the introduction of a five-star home sustainability index - a rating based on quality and comfort; affordability; environmental soundness and impact on local economy; water and energy- efficiency; and reduction of energy bills. The system is already in use in Australia. With so many tried and tested laws and guidelines around the world to tap, it is a matter of a little thought, good planning and strict enforcement that the ideals of sustainable housing would be achieved.

7.0 METHODOLOGY

The methodology of this study will be a quantitative approach where questionnaires will be developed and will be distributed to respondents of the defined and selected stakeholders. Data collected will be analyzed using frequency, cross tab and ANOVA analysis. This research will consist of two types of research data i.e. the secondary data and the primary data. This research will sample about 1000 respondents and the sample will be taken from selected cities of major states such as Pulau Pinang, Perak, Kuala Lumpur, Selangor and Johor, where most of the construction activities occur. At the end of the research, recommendations and guidelines that can be beneficial to local players in the construction industry for successful implementation of sustainable housing will be presented.

8.0 CONCLUSION

This paper introduced sustainable housing concept and presented a framework for supporting and assessing sustainability within the housing and construction industry. Housing in particular can make a significant contribution to sustainability because it involved major issues pertaining to the resource consumption in a large amount in its construction, maintenance and use. It is also a fixed asset with a long life and it is central to quality of life and has implications beyond housing affecting transport, health, employment and community.

With reference to the existing studies and projects, there is a lack of sustainable housing practices in housing development in Malaysia although a lot of campaigns and programs have been undertaken to promote and to raise awareness especially on sustainable development issues. No study found on the subject of assessing awareness and readiness level of stakeholders to the

sustainable housing subject especially in Malaysia.

There is a need for a change of culture with regard to housing development in Malaysia which places sustainability centre stage. This should include the developers (be they housing associations or for-profit companies), builders and land use planners and also the tenants and owners. There is also a need for the government to provide more incentives for energy efficient refurbishments in homes and other incentives to stimulate the sustainable building practices, as well the establishment of government legislation on this matter. Rising of awareness is important for all those involved, and the stakeholders should prepare to start implementing sustainable housing practices in Malaysia in a serious manner.

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