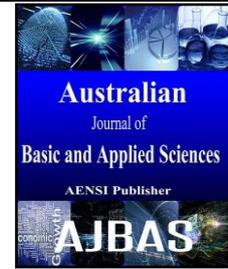




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Green Homes Development in Malaysia: A Review on Energy Perspective

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ABSTRACT

Nowadays, Malaysia already has a green building index to make sure that everyone in the construction industry will take sustainable development critically. This study attempted to examine the existing literature of energy efficiency and alternative resources that has been produced in developed countries. By reviewing the existing literature found that the energy efficiency more focus on the designs of the houses and encouragement from government in practices of green energy in housing development. 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 energy practices can enhance house buyers' requirements of green homes in Malaysia.

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INTRODUCTION

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, N.Z., 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.

One of the green building criteria used in the more developed countries is that the buildings must have energy-saving characteristic. According to (Acwmasrrb, A.C., 2003), 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.

(Essa, R., 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, T.M., 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, A. and D. Harris, 2004) observes that the two most pressing problems happening now are the energy crisis and world's increasing demands for sustainable houses. This study attempt to examine the existing literature of energy efficiency and alternative resources that has been produced in developed countries.

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Housing Development in Malaysia:

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, C.I., 1995). (Sufian, A. and R.A. 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 governed by the Housing Development (Control and Licensing) Act 1966 (HDA).

Definition of Green Homes:

(Acwmasrrb, A.C., 2003) defines a green building as the implementation of green concept on a building from the early stage of its development until the completion. Recent studies show that a green building could minimise the environmental impact by using the green building system approach. According to (Palanivelraja, S. and K.I. Manirathinem, 2009) "green" or "sustainable" buildings use key resources like energy, water, materials, and land in efficient ways, which contribute to improved health, comfort and productivity. As mentioned by (Simula, H., 2009) "sustainable," "environmentally friendly", "green", "pro-environmental" and "ecological" have often been used interchangeably to describe that the production of green product uses less energy, recycles materials, reduces waste and pollution, and preserves natural resources.

Energy Efficiency:

Green building industry has grown enormously over recent decades. The designs of building have evolved from being in energy-efficient forms to ones that consider a multitude of environmental impacts (Engel-Yan, J., 2005). The theory of green buildings includes a lower environmental load, higher energy efficiency and resource saving throughout a building's whole life cycle and provides comfortable, safe and healthy environments for people (Xia, C., 2008). Designing low-energy buildings in high density areas requires a special treatment of the planning of urban structure, co-ordination of energy systems, and integration of architectural elements and utilisation of space. As building design needs to consider requirements and constraints, such as architectural functions, indoor environmental conditions, and economic effectiveness, a pragmatic goal of low-energy building is also needed to achieve the highest energy efficiency, which requires the lowest possible need for energy within the economic limits of reason (Omer, A.M., 2008). Through the

application of alternative building systems with the for energy conservation, it is hoped that a pleasant living environment can be created for the people of hot-arid regions despite the harshness of the climate through earth-sheltered construction and a facilitation of implementing the strategy (Al-Temeemi, A. and D. Harris, 2004).

Malaysia has various energy policies including the National energy policy (1979), National Depletion policy (1980) and Fuel Diversification Policy (1981, 1999). The National Energy Policy has three primary objectives; supply, utilization and environmental. The first primary objective is to ensure the provision of adequate, secure and cost-effective energy supply by developing indigenous energy resources (both non-renewable and renewable) using least costly options and to diversify supply sources (both from within and outside the country). The second objective is to promote an efficient utilization of energy and discourage wasteful and non-productive patterns of energy consumption within the socio-cultural and economic parameters. The final objective is to ensure that the factors pertaining to environmental protection are not neglected in the pursuit of the supply and utilization objectives (Mohamed, A.R. and K.T. Lee, 2006). This could guarantee that the energy is used efficiently and the environments could be protected.

(Rosenquist, G., 2006) studies show the estimated national impacts of the upgrades in energy efficiency standards for residential and commercial equipments. These impacts approximate the opportunity for national benefits that may be lost if energy efficiency standards for residential and commercial equipments are not upgraded and expanded from the current levels. Apart from electronics, the greatest savings come from standardized commercial refrigeration, followed by lighting and air conditioning. Other than that, the largest savings in the residential sector come from standardized electric water heaters and torches.

The energy efficiency of major household appliances has improved significantly in the recent years (Young, D., 2008). According to (Rosenquist, G., 2006) the energy efficiency standards set the minimum levels of energy efficiency that must be met by new products. Depending on the dynamics of the market and the levels of standards, the effect on the market for a given product may be small, moderate, or large. In the absence of new and upgraded energy efficiency standards, it is likely that many new products will enter the stock with lower levels of energy efficiency than would otherwise be the case. Once in the stock, it is either impossible or more costly to improve the energy efficiency. Therefore, by not expanding or upgrading energy efficiency standards, opportunities for saving energy would be lost. (Young, D., 2008) states that the extent of the overall energy demand depends on how quickly the newer and more efficient models replace

older models in household use. In other words, the rates at which households replace various appliances have important implications for the realization of household energy demand savings in response to technological improvements. According to (Roarty, M., 1997), products that are in considered energy-efficient “white” goods are fridges and washing machines; organic food which is natural and additive-free; products made from recycled materials (e.g. paper) or using reusable containers (e.g. washing liquid); and low emission and fuel efficient cars. Table

Alternative Resources of Energy:

Energy is essential to the functioning of cities. It provides services that underpin economic activities and enables residents to meet basic needs such as food, shelters, health, education, and mobility (Walsh, E., 2006). Looming scarcities and the associations of social, economical, and ecological impacts with conventional sources of modern energy like fossil fuel or nuclear reactors are again pushing the developments of renewable energy sources, namely biomass, hydro, wind, and geothermal (Buchholz, T.S., 2007). According to (Omer, A.M., 2008), the adoption of green or sustainable approaches to the way in which the society runs is seen as an important strategy in finding a solution for energy problems. The key factors in reducing and controlling CO₂, which is the major contributor to global warming, are the use of alternative approaches to generate energy and the exploration of how these alternatives are used today and may be used in the future as green energy sources.

Sustainable energy is an energy that, in its production or consumption, has minimal negative impacts on human health and could provide a healthy, vital ecological system. Renewable energy is a form of sustainable energy and the term is used to describe a wide range of naturally occurring, replenishing energy sources (Omer, A.M., 2008). Recently, there has been an increase in the research directed at the progression of technologies that can provide reduction in energy consumption without decreasing the satisfactory level of thermal comfort in buildings. Various building technologies can now be employed to reduce both the energy consumption and environmental impacts of air-conditioning systems in hot climates (Al-Temeemi, A. and D. Harris, 2004). “Renewable Energy for Power Generation: Status and Prospects” claims that renewable energy is the second largest power source after coal (39%) and it is followed by nuclear (17%), natural gas (17%) and oil (8%). From 1973-2000 renewable energy has been growing 9.3% every year and researchers predict that this rate will become 10.4% by 2010. The building structure should help the energy system by being able to exploit renewable energy that can minimize the energy expenditure and improve thermal comfort (Zhai, X., 2007). Solar

energy, which is abundant and clean, has received much attention in energy system design of building. Recently, solar water collectors have undergone a rapid development; they have been installed with the main purposes of preheating domestic hot water and covering a fraction of the space heating demand. Another attractive application for solar energy is solar cooling. It is a result of the coincidence of peaking cooling loads with the available solar power. Considering the problem of peak load of electricity consumption in summer due to electric chillers, solar-powered air-conditioning system could be an effective solution because it not only makes the best use of solar energy, but also converts low-grade energy (solar energy) into high-grade energy. In addition, it is meaningful for energy conservation and environment protection (Zhai, X., 2008).

According to (Mohamed, A.R. and K.T. Lee, 2006), the development of renewable energy in Malaysia is still in the early stage. As mentioned in the 8th Malaysia Plan (2001-2005), the government has replaced the Four Fuel Diversification Policy with a Five Fuel Diversification Policy in 1999 by adding renewable energy as the fifth source of fuel. Presently, renewable energy in Malaysia is still generated in a small-scale basis. However, converting efforts are currently undertaken by the government to develop and promote the utilization of renewable energy resources. (Omer, A.M., 2008), mentions that the existing renewable energy technologies (RET) could play a significant mitigating role for the country’s development, but the economic and political climates have to change first.

Although the use of renewable energy resources has a lot of benefits, it faces numerous challenges. Firstly, the development of technology to convert the renewable energy resources into usable forms is still not well-established. Although it has been reported by several research and studies that there is a technical feasibility in the generation of energy from renewable resources, the commercialization of the research findings has not been fully undertaken on a large scale (Mohamed, A.R. and K.T. Lee, 2006). Secondly, the high cost of renewable energy generation faces stiff competition from cheaper alternative energy sources such as fossil fuels (Mohamed, A.R. and K.T. Lee, 2006) and conventional electricity-driven or gas-fired air-conditioning systems (Li, Z. and K. Sumathy, 2000).

(Mohamed, A.R. and K.T. Lee, 2006) mentioned that Malaysia’s climatic conditions are favourable for the development of solar energy due to the abundant sunshine throughout the year. A photovoltaic (PV) system consists of several solar cells that convert light energy into electricity should be built. Photovoltaic system is an elegant means of producing electricity on site, directly from the sun, without concerning on fuel supply or environmental impact. Solar power is produced silently with

minimum maintenance and without polluting and depleting the resources. According to Seng, *et al.* (2008), in Malaysia the owners of PV systems are not able to make any financial return from their investment on the PV systems even after the government has provided a subsidy of up 70% of the PV capital. Therefore, the current size of PV market is very small; only about 470kW is owned by a small number of domestic customers. The size of PV market in the country is huge since the utility companies have about 6 million domestic customers and 1.2 million commercial and industrial customers. Therefore, it may be necessary for the government and utility companies to consider offering a higher tariff of PV electricity to PV owners in order to promote PV installations. (Omer, A.M., 2008) highlights that the economical utilisation of solar energy in all its varied forms – PV, direct solar thermal, renewable fuels, ocean-thermal, and wind can offer the world the technology that can conserve valuable non-renewable fossil resources for the future generation to enjoy and reduce the many types of pollution.

According to (Xia, C., 2008), if the extra consumption of renewable energy system (RES) is ignored, the contribution of the RES may be exaggerated and deviated from the truth and this situation could lead to a wide use of RESs without improving their efficiency levels. In addition, conventional energy system (CES) also plays an

important role in assessment results; the higher the efficiency of the CES, the lower is the RES contribution.

(Xu, L. and T. Ojima, 2007) demonstrates that with the information technology revolution, the application of SOHO (small office and home office) leads to more energy consumption, especially the energy for household air-conditioning systems. (Li, D.H., 2008) say in subtropical Hong Kong, most of the electricity is used for creating thermally and visually comfortable indoor environments through air-conditioning and artificial lighting. Figure 1 shows that air conditioning and refrigerator cause nearly 70% of the average household electricity consumption and air conditioning is the largest consumer of electricity at homes. Even though the threat of “Global Warming” is widely present and the cost for energy is increasing, keeping the home cool will become increasingly important in the future (Aun, C.S., 2008). (Al-Temeemi, A. and D. Harris, 2004) say that air-conditioning costs involve the cost for its installation, the cost for its maintenance, and the cost for any kinds of detriments. (Omer, A.M., 2008) states that energy savings from the avoidance of air conditioning can be substantial and also air-conditioners has brought great pressure upon energy, electricity, and environment (Zhai, X., 2007). For the households, air-conditioners have become important in keeping them comfortable even though they have to spend a lot of money for the machines.

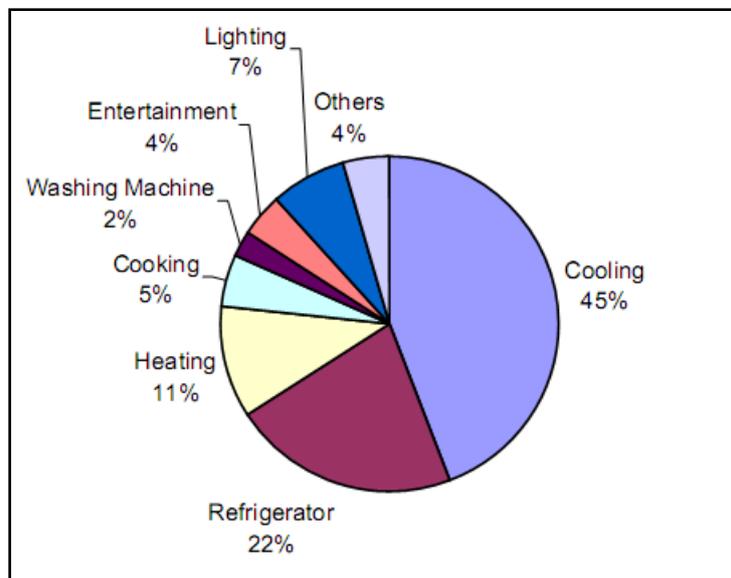


Fig. 1: Average Home Electricity Consumption.

Source: (Aun, C.S., 2008)

Conclusion:

It can be concluded that the development of green homes focus more on using energy efficiently and finding alternative resources to make humans live in healthy environments and future generations get the resources they deserve. To make green home

projects successful in Malaysia, green homes criteria must suit to the requirements and interests of the house buyers in Malaysia. The perspective of house buyers is as important as the points of views of architects and housing developers. Meeting the requirements of house buyers is important in the

concepts of supply and demand. Suppliers (housing developers) have to gratify the house buyers by providing their essential needs if they do not want to fail.

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