
LOW CARBON CITIES – THE WAY FORWARD IN REAL ESTATE DEVELOPMENT IN MALAYSIA

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Abstract

Malaysia has undergone rapid urbanization and economic growth for the past decades and is expected to continue to have an average economic growth of 5% – 6% per annum in the next five years. This phenomenon of growth and pursuit of socio economic progress has great impact not only on the economy but also on community lifestyle and environment. The Malaysian government adopted the concept of sustainable development as early as mid 1990s to address some of the emerging environmental issues and more specifically recent issues of climate change. Consequently, the concept of new urbanism, compact city and promotion of public transport was highlighted in many urban development plans. The Malaysian government announced a commitment of voluntary 40% reduction in carbon dioxide (CO₂) emission intensity by 2020 during the Conference of Party (COP15) meeting in Copenhagen in 2009. In parallel to this commitment of CO₂ reduction, the concept of sustainable development in urban planning will incorporate a more comprehensive and quantitative approach in the preparation of development plan as well as in exercising the routine development control practice at the local planning authority. Therefore, the scope of work of urban and regional planning should integrate the concept of low carbon city to reduce carbon emission. The paper discusses low carbon emission in urban planning and the policy packages required to reduce energy consumption and CO₂ emission. It explores the existing framework for carbon reduction in Putrajaya towards providing the platform for development of low carbon emission in real estate development and low carbon society in Malaysia. Finally, the paper believes that the policy packages of the environmental blueprint for the overall master planning of the cities such as Putrajaya, Cyberjaya and Iskandar Malaysia will be effective for real estate development in Malaysia.

Keywords: *low carbon cities, sustainable development, real estate, energy and CO₂ emission*

1.0 INTRODUCTION

The current global complex environmental problems have resulted in environmental degradation which has caused, among other things, global warming. The global system of environmental management which focuses on lifestyle and industrialization is moving slowly in the right direction (Said et al., 2003). As nations find solutions to climate change, Malaysia is facing the challenge of ensuring sustainable development in the cities by establishing a number of projects on low carbon societies. Cities are increasingly driving meaningful action towards creating sustainable environment through low carbon societies especially by imbibing the culture of green technology through the preventive and

corrective measures to encourage the use of green technology and low carbon lifestyle.

Enhancing quality of life, land and property values of green cities will involve the quantification from Low Carbon Society (LCS) modeling to assist better understanding of the impact of proposed actions, sub actions and programs. Although there is definitely economic benefit and strong commercial case for green and low carbon cities by promoting green building and development, decarbonizing planning code by promoting mixed use development that allows multiple compatible uses to be in close proximity to one another is an important feature of low carbon city. This will minimize transportation infrastructure impacts

and create a compact efficient neighborhood. Similarly, enforcement of the Green Building Index (GBI) in the real estate sector should further encourage low carbon emission in Malaysia.

Green cities or Low carbon cities need to have a mindset and behavior of Low Carbon Societies (LCS). It is believed that a joint effort between different professions (Planners, architects, engineers and related environmental profession) will assist in the establishment of green or low carbon idea through urban development in the country (Ho CS, 2011).

Energy consumption for the operation of electricity, transport and waste management constitutes major emission sources due to the fossil fuel based energy whose combustion results in carbon emission. The urban planning policy packages required to achieve Low carbon cities must discuss issues of sustainability through low carbon emission and suggest energy efficiency, renewable energy, technological innovation, changing behavioral attitude as a means to reduce carbon emission in real estate developments.

The rising populations in urban areas increase pressure on the resources, apparently causing degradation of the ecosystems. The urban planners and governments are increasingly facing the challenges of combating the menace by preventing unsustainable developments from reaching critical levels. Although the means to achieve this target or measuring progress towards it, is currently not entirely evident, the enthusiasm of decision-makers in Malaysia appears commendable through low carbon projects and the development of low carbon societies such as the Putrajaya, Cyberjaya and Iskandar Malaysia among others.

This paper explores the existing framework of Malaysian Government towards a holistic system approach to provide the platform for understanding the urban complexities in order to effectively manage the natural, human and man-

made resources such as energy, transport, water and waste, among others. The urban subsystems can be integrated into a framework through municipal plan formulation based on the promotion of global warming counter measures and modeled to influence human behaviors which can be used for decision making and management relating to policy, regulation, planning, design and development of urban systems. The paper suggests strategies to encourage low carbon emission and combat global warming tendencies through institutional participation and regional efforts.

2.0 RELEVANCE OF LOW CARBON CITIES DEVELOPMENT

The challenge of the recent environmental consciousness is not unconnected with the present rate of energy and resource consumption towards coping with increasing human population and global economic trend. The resulting environmental crisis is observed to have wide reaching consequences due to excessive carbon emission from the burning of fossil fuels for energy use for domestic purpose, transport and production as well as other operations. Most activities of the city contribute significantly to deplete the environment causing imbalance of the environmental system, and a concern and threat to human existence through climate change. This is more pronounced in the real estate development sector which is central to social, economic and physical development.

Human activities affect environmental sustainability and may have negative impact on the environment. The real estate development features various activities that have direct and indirect implication on the environment. The large physical and demographic sizes, heavy traffic and the substantial amount of waste generation, water and material intake as well as electricity and hydrocarbon fuels consumption in operating appliances and transportation, results in the consumption of reasonable amount of energy and also produces large quantity of carbon dioxide (CO₂) emission in cities. The

large concentration of people in the real estate sector may significantly affect development due to unsustainable practices and poor environmental management.

Low Carbon City relates to carbon minimization in all sectors by developing a society that emits GHG only in an amount that can be absorbed by nature and achieving a lifestyle that realizes richer quality of life through health and interaction with nature as well as promoting nature-friendly technologies such as the utilization of biomass (Ho, 2011).

It became paramount that cities are developed to respond to issues of sustainability by protecting and improving the environment in a manner that addresses the challenges of global warming through carbon emission. Real estate development offers the potential for the promotion of low carbon emission so as to ameliorate the menace of global warming.

In view of environmental degradation and negative impact of human activities through continuous emission of carbon dioxide (CO₂) in cities due to unsustainable practices, the real estate developments become an important field of study for low carbon cities. Achieving emission-free environment infers the reduction of CO₂ emission, by identifying the sources, types and the extent of emission and influencing the behaviors of the residents (Abdul-Azeez, 2012).

3.0 PLANNING LOW CARBON CITY

Since Kyoto Protocol (COP3), various initiatives have been promoted aimed at the prevention of global warming at national and local levels. Societies are promoting policies to reduce CO₂ emission in cities and introducing mitigating strategies to ameliorate global warming conditions at work places, where greenhouse gas emission exceeds specific levels. Also, local and municipal authorities encourage low carbon projects so as to attain zero emission of GHG in

housing or commercial estates, industries and mixed use housing developments as well as in other sectors of the urban districts.

Cities generate very huge carbon dioxide emission and are responsible for consuming two - thirds of the world's energy and generating over 70% of its greenhouse gas emissions.. About 2.6 billion tCO₂e is generated by the world's 50 cities annually. Currently, half of the world's population lives in cities and this is expected to reach 70% by 2050. Also cities account for over 67% of the energy related global greenhouse gases, expected to rise to 74% by 2030 (The World Bank, 2010).

Many including Robert Zeollick (President of World Bank) believes that cities will take the lead in overcoming climate change. Consequently, cities around the world committed to implementing meaningful and sustainable climate policies are coming together to form organization such as the 'Cities Climate Leadership Group (C40)' among others, which locally engaged in actions that will help address climate change globally. A major strategy to achieve this objective is through the urban sub systems such as the real estate development.

The real estate development sector is a huge and important urban system, responsible for funding, location and creating development projects such as residential commercial and industrial estates which supports the growth of the city. Real estate development offers greater potential for the understanding of the energy consumption patterns of estates and the carbon emission phenomenon of service sectors of the cities. Therefore, the existing approaches to address low carbon emission in the cities should be adequately directed towards reducing the impact of energy consumption in real estate development and the prospects for carbon emission reduction through effective planning of the pattern of transport circulation and energy consumption for electricity (Meng et al., 2007).

Controlling greenhouse gas emission to prevent global warming is an issue to be tackled worldwide (Onishi and Kobayashi, 2011). Government agencies and municipalities especially in developed nations such as Denmark, United Kingdom, Germany and other EU nations as well as Japan and South Korea are actively involved in ways to reduce emission by promoting activities that aim to achieve low carbon society, and also by planning and designing sustainable model based projects as well as formulating policies and mitigation strategies to ameliorate conditions that may result in global warming.

The quantification of CO₂ emission is vital to reduce emission in the sector of real estate development and achieve low carbon society. This will required plans or blue prints to reduce emission from electricity as well as plans to realize reduction targets and promote energy conservation in the designs of real estates. Furthermore, the use of alternative forms of energy as well as the adoption of technologies for pollution control, energy and resource saving and greenhouse gas reduction technology and by setting targets to specifically reduce emission by certain percentages and dates through Clean Development Mechanisms (CDM) and other low carbon techniques.

Consequently, in line with the desire of the Malaysian government to reduce carbon emission in the country, there is the need for designing appropriate policy for low carbon real estate developments. This will also conform to the goal of promoting low carbon Putrajaya as well as low carbon communities in Iskandar Malaysia region(Ho C.S., 2011).

The assessment of carbon emission from energy use will offer the opportunity for the establishment of low carbon real estate developments and cities which will offer better energy management and reduce energy cost and also promote low CO₂ emission thereby reducing the cities' contribution to global warming.

4.0 POTENTIAL OF REAL ESTATE DEVELOPMENT

Among the potential of the real estate development is that it offers opportunity for the development of green buildings. It also provides the most appropriate guide for the process of buying, selling, investing, or developing and renovating real estate, and offer full services on making homes or business more eco-friendly, through "Green" buildings resources.

Green or sustainable buildings save energy and resources, recycle materials and minimize emission of greenhouse gases such as carbon dioxide. "Green" real estate also harmonizes with the local climate, traditions, culture and the surrounding environment. Also it sustains and improves the quality of human life whilst maintaining the capacity of the ecosystem as well as increasing the productivity workplaces.

Consequently "green" homes demonstrate that incorporating sustainable design into the construction process will help to lower operating costs, increase home value, reduce maintenance issues and improve indoor environmental quality in the long-term. With commitment to sustainable low carbon emission designs, building awareness programs will assist to achieve the ultimate goal of transforming the built environment and be the pivotal required for low carbon cities

Finally, real estate development could be employed at national level to attain a new standard in sustainable construction so as to promote a Zero Energy, Zero Water, Zero Waste, Zero Carbon, Zero Emissions residence. The adoption and enforcement of a rating system such as the Green Building Index (GBI) in the real estate sector in Malaysia will assist to achieve the goals of low carbon cities in the country. Also the public can bring about reduction in CO₂ emissions through the use and selection of green products and by making investments in low carbon companies. Authorities can also encourage policies that

enable people to be directly involved in environmentally conscious companies to improve financing of green projects such as community power generation, wind farms, biomass power stations and fuel production companies.

Real estate development is an important system in city development. Among its functions is the management of projects by analyzing site limitations and impacts. The implementation of GHG reduction policies strategies to combat global warming tendencies in real estate can be realized through the design, creation or renovation of commercial real estate and industrial sites, office buildings and retail properties that conforms to models of low carbon emissions. In view of the activities and practices within real estate development which involve high consumption of energy for lighting, cooling and operating appliances as well as for movement and manufacturing, the current problems of global warming in cities require the involvement of real estate development through planning and reduction of CO₂ emission from energy use that places stress on the environment.

Furthermore, research and education in real estate development could save money on utilities, and make living more energy efficient and eco-friendly, as well as promote a "greener" lifestyle, that offer potentials for reducing carbon dioxide emission. This can be achieved through effective urban planning as a means of increasing happiness of residents through participation in the entire urban planning process to conserve the environment and by investing in green urban planning.

The key to creating low carbon cities in the field of urban planning is to freely come up with ideas to create a complementary and mutually supportive situation in which people's lives are improved and they have a better environment in which to live (Kobayashi, 2011). This new concept of urbanism may produce compact city and highlight green public transport in many

urban development plans as a strategy to attain low carbon cities.

5.0 EXISTING APPROACHES IN LOW CARBON CITIES DEVELOPMENT IN MALAYSIA

The concept of sustainable development is not new in Malaysia. A major approach of addressing emerging environmental issues in the country is through low carbon cities development. Among the research projects directed towards sustainable low carbon society are the Sustainable Iskandar Malaysia 2025, the Putrajaya Green City 2025 as well as other micro projects for low carbon emission such as the Malaysian Green Technology Corporation building or the Low Energy Office (LEO) in the universities aimed at cutting down carbon emission by measuring existing levels of emission and setting targets to reduce the quantity through mitigation strategies and innovations. The government's commitment of voluntary 40% reduction in CO₂ emission intensity by 2020 is a challenge that has led to the creation of administrative structures and more comprehensive and quantitative approach to CO₂ reduction are witnessed in Putrajaya, Cyberjaya green cities and Iskandar Malaysia (Ho CS, 2011).

The application of the green technology in real estate buildings is another approach that will promote low carbon development so as to reduce the building services emission related impact of energy on the environment. The implementation of building designs that inculcates energy efficiency (EE), renewable energy (RE), water management and solid waste management as well as the use of low carbon foot print materials may assist to achieve low carbon cities in Malaysia. Also, the use of energy efficiency appliances and equipment and encouraging energy and observing environmental management practices in the operation of real estate development are key steps towards low carbon cities.

6.0 MACHINERY FOR DEVELOPMENT AND IMPLEMENTATION OF LOW CARBON POLICIES

The realization of the relevance of low carbon cities to the overall development of Malaysia may have informed the establishment of the existing machinery and institutional agencies responsible for the development and implementation of low carbon policies in the country. For instance the Malaysian Green Technology Corporation recently relabeled the Low Energy Office (LEO) has annual electricity consumption of about 100 kWh/m²/year, while the Zero Energy Office consumes about 50 kWh/m²/year by supplementing another 50 kWh/m²/year with solar energy (Figure 1). The government agencies are among the machinery for development of low carbon in Malaysia and constitute the platform for research in low carbon development whose findings can assist to promote the low carbon development in the real estate sector.

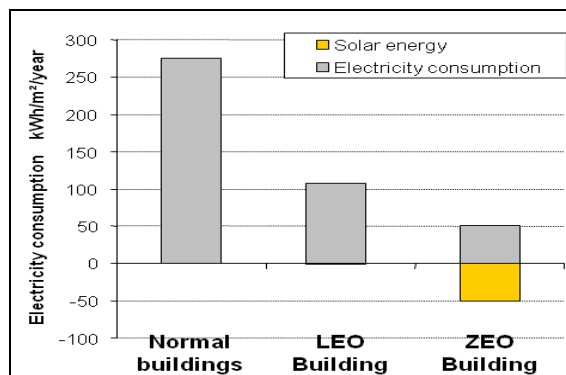


Figure 1: The Malaysian Office Building Energy Index

Source: Malaysian Green Technology Corporation formerly known as Pusat Tenaga Malaysia (PTM), 2009.

Other tools for the implementation of low carbon policies include the Green Building Index (GBI) to save utility cost and preserve the quality of the environment, the MS 1525- the code of practice on energy efficiency and renewable energy as well as other low carbon business strategies and incentives.

The Green Building Index (GBI) serves as key design principles that allow the setting of performance parameters for the development and implementation of low carbon policies. Launched in 2009, GBI considers six (6) criteria such as Energy efficiency, Indoor environmental quality, Sustainable site & management, Material & resources, Water efficiency, Innovation. The green building Index (GBI) of non-residential building for Malaysia is shown in Figure 2. Similar index should be developed as key design principle for real estate development to save utility cost, preserve the quality of the environment and promote low carbon society in the country.

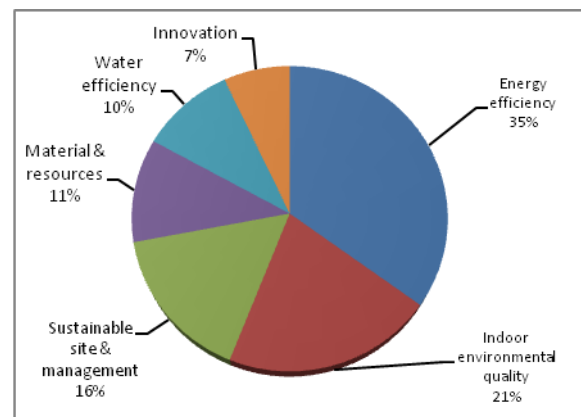


Figure 2: Green Building Index (GBI) of non-residential building for Malaysia
Source: Aun, C. S. (2009).

The MS 1525 established in 2007 is the code of practice on energy efficiency and use of renewable energy for buildings. It is the cornerstone of Malaysian Energy Efficiency and a key reference document for building envelope. The document requires all buildings exceeding 4000m² of air condition space to be provided with environmental management system (EMS) system as a regulatory strategy. It also provided that the Overall Thermal Transfer Value (OTTV) shall not exceed 50W/m², while RTTV should not be more than 25W/m² (Aun, 2009).

The provisions of the MS 1525 code of practice will assist to regulate the energy use in real estate development and promote energy efficiency and the use of renewable energy towards achieving low carbon society.

Other tools and business strategies and incentives that help to promote low carbon society include the Energy Saving Label that reward green products and companies that implement low carbon policies and programs. The Green Cards which rewards club members with points for recycling and helping in one way or the other is also an incentive towards developing green environment.

Cases of sustainability initiatives among Malaysian Universities as well as in designated low carbon urban projects such as Putrajaya, Cyberjaya and Iskandar Malaysia regions carried out by Low Carbon Society research group of Universiti Teknologi Malaysia (UTM) focused on the assessment of carbon footprints through the measurement of carbon emission attributed to the consumption of energy for various activities and operations. Such assessments involved the measurement of carbon emission from electricity energy consumption and transportation (Abdul-Azeez, 2012). This will assist to determine the quantity of carbon emission and will also offer opportunities for setting targets to reduce emission from fossil fuel energy sources through mitigation strategies and other countermeasures.

A major example of projects where tremendous achievement has been recorded in this direction in the country include Putrajaya Green City where carbon emission has increased six (6) times from 2007 from 0.6 million kCO₂ to 4.3 million kCO₂ (Ho, 2011). Notwithstanding, twelve main actions recommended to achieve Putrajaya Green City are enumerated in Table 1. These constitute categories of environmental CO₂ emission reduction strategies namely; the Low Carbon Putrajaya, Cooler Putrajaya, 3R Putrajaya (reduce, reuse and recycled) proposed

as counter measures to reduce overall emission and promote low carbon emission in the region.

Table 1: Selected actions to reduce CO₂ emission and achieve Putrajaya Green city

No	Action Names	Category
1	Integrated City Planning & Management	Low Carbon Putrajaya
2	Low Carbon Transportation	
3	Cutting Edge Sustainable Buildings	
4	Low Carbon Lifestyle	
5	More and More Renewable Energy	
6	The Green Lung of Putrajaya	
7	Cooler Urban Structure and Buildings	A Cooler Putrajaya
8	Community & Individual Actions to Reduce Urban Temperature	
9	Use Less Consume Less	3 R Putrajaya
10	Think Before You Throw	
11	Integrated Waste Treatment	
12	Green Incentives & Capacity Building	Inter -Category

The environmental target to achieve Putrajaya Green city aims at 60% reduction of the 2007 CO₂ emission intensity by 2025 by implementing counter measures for low carbon emission. The implementation of the counter measures for low carbon emission is expected to reduce the peak temperature of Putrajaya in 2007 by 2°C in 2025. Other policy packages for Putrajaya Green City include the 3R- through the reduce, reuse and recycle approach, which also aims to reduce the final ‘Business as usual’ (BAU) disposal of solid waste and greenhouse emission by 50% as shown in Figure 3.

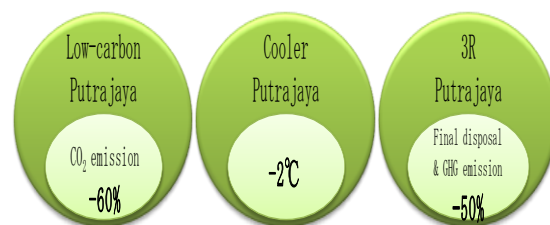


Figure 3: Components of environmental targets to achieve Putrajaya Green city

The introduction of the low carbon countermeasures in the real estate development in Malaysia will assist to achieve similar result in all the cities and promote low carbon society in the country. Furthermore, low carbon emission can be achieved in the real estate sectors by adopting the integrated model to calculate the CO₂ emission as used for Putrajaya Green city (Figure 4). This will involve collecting data from relevant sources and using an energy model / tool such as Energy Snapshot (ExSS) to determine quantity of greenhouse gas emission and setting targets for carbon reduction.

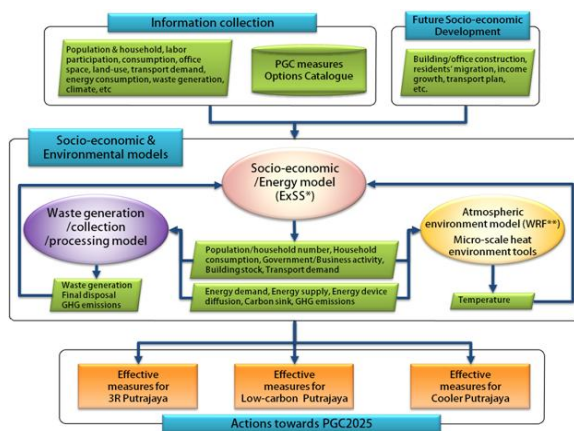


Figure 5: Integrated model used to calculate the CO₂ emission for Putrajaya Green city

Another major approach of achieving low carbon emission in the real estate sector is through policies such as the National Policy on the Environment, National Green Technology Policy, National Physical Plan and Urbanisation Policy among others. Also strategies and performance indicators based on the framework for Low Carbon Cities and assessment system in the form of guidelines and rating tools are desirable actions for the establishment of energy efficiency in new buildings as well as energy conservation guidelines for real estate development.

Consequently, the concept of city in the garden of Putrajaya, the new Malaysian Federal Government Administrative Centre as well as

the recommended low carbon approaches discussed can be emulated to promote low carbon emission in the real estate sector in the country. However, this will involve designing roadmaps towards low carbon society and packaging key policies into actions that introduce options for low carbon emission in the early stage of planning of real estate development so as to set and achieve emission reduction targets within a comfortable built environment.

7.0 CONCLUSION

In conclusion, Malaysia is the highest energy consumer among the ASEAN region and the bulk of this energy is consumed in the cities, where about 30% is consumed in buildings alone (Aun, 2009 ; Ho, 2011). The way forward for low carbon cities therefore is to critically examine the issue of energy consumption in the real estate development and identify the main challenges and prospects for effective management and carbon reduction.

However, the strategies to achieve low carbon cities include a holistic approach that encompasses all aspects of city life are important if the real estate sector is to contribute effectively to sustainability and low carbon emission as well as reduce global warming. Also sustainability initiatives must be embedded into broader strategic plans so as to raise awareness on green living and promote green building initiatives.

The promotion of sound environmental awareness and education as well as ‘Business Unusual’ (BUU) approach to energy consumption practices is also a way forward towards low carbon real estate development in Malaysia. Furthermore, encouraging green transportation through the use of bicycle and public transportation as well as designing compact layouts will reduce carbon footprint for real estate development.

Environment management (EM) practice is very crucial to maintain efficient use of energy in the operation of buildings; however, energy management awareness among the users is also very important - without which buildings with super green technology features and design may not operate efficiently owing to energy waste. In order for the installed features to function adequately and according to the design, there is a need for a high sense of maintenance and commitment to enable the green features to perform better.

Also the development and application of Green technology products, equipment, and systems used to conserve the natural environment and resources, will minimize and reduce the negative impact of human activities. Such technology may also minimize the degradation of the environment towards zero or low greenhouse gas (GHG) emission. The use of green technology products is also safe for and promotes healthy as well as improved environment for all forms of life while promoting the use of renewable resources and also conserving the uses of energy and natural resources.

Finally, the goal of carbon emission reduction to overcome the threats of greenhouse gas to global environment is very achievable through sustainable development and a conscious effort of all stakeholders in coming to an agreement (consensus) on the approach of objective measurement of factors relevant to unsustainable practices and global warming (Abdul-Azeez, 2012). Therefore, in addition to the existing performance standards, it is desirable to involve all stakeholders in the design of the roadmap of actions towards low carbon cities in Malaysia, through the preparation of Master plans and blueprint as a guide to low carbon emission in real estate development.

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