A CASE STUDY ON SUSTAINABLE BUILDING BASED ON GBI: POLO RESIDENCE

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ABSTRACT

Sustainability implies the ability of a system to maintain itself and be maintained over time without threatening the stability of other systems upon which it depends. Polo Residence centrally located in an exclusive and sought after address in the middle of Ipoh, also offers great accessibility to a wide variety of entertainment, shopping, food and services. This study aimed to investigate the design building components as well as energy and environmental system for Polo Residence, Ipoh. Data collection were done using qualitative approached whereby an observation and interviewed session was conducted with the supervisor of the building. The research found that the use of natural light, natural ventilation, recycled materials, water efficiency and some innovations in Polo Residence building have been cared orderly. The finding obtained from this study shows that this building are not fully sustainable according to Green Building Index criteria. Due to that, a few suggestion were discussed for future sustainable building design.

Keywords: sustainability; accessibility; Green Building Index; sustainable component

INTRODUCTION

Malaysia has received a huge attention from government agencies, private and public organization for almost a decade upon the green building issues. In 2009, the launching of National Green Technology Policy (NGTP) emphasis on green building has been focused on promoting renewable energy (RE), energy efficiency (EE) and as well as green building index (GBI). The construction industry has confirmed to be a major contributor to greenhouse gas emissions (GHG), which sums up to 50% global carbon dioxide emissions (Maltzman & Shirley, 2011). This is because the development of the construction industry uses 40% of the material flowing in the global economy and produces 40-50% of global GHG emissions and acid rain

agents (Khasreen et al., 2009; Suzaini et al., 2015)). On the other hand, in the globalization era, the development of the construction industry seems to be unavoidable. Thus, for the needs of living beings and population growth in line with the protection and prevention of the environment, numerous indicators have been approached by people around the world including sustainable development followed by sustainable construction (Shafii, 2008).

There is a struggle to justify the implementation and execution of Green Building Projects from the design process until the maintenence work (Syahrul Nizam Kamaruzzaman et al., 2016; Mun, 2009). The existing guidelines and Code of Practise on Energy Efficiency and Renewable Energy to reach low carbon building such as Dasar Teknologi Hijau and MS1525 does not cover the method on how to implement green building project in Malaysia. The existing guidelines and rating tool also does not integrate with the design process, project management and maintanence procedures with local government policies or authorithy guidelines and requirement. The existing guidelines and rating tool also does not gives clear role of project manager on managing the the building projects. Futhermore, choosing the proper rating tool and adapting it to the green building projects is another issues that should be address systematically in conjunction to implement green building projects in Malaysia.

Due to the establishment of various sustainable approaches, many green building rating systems have been promoted to assess the criteria of green building for construction. The green building rating system will assist the major role of the green building project on understanding the impact and solution of every design selection. Green building rating system is according to its nature and role depends on location and environment. Malaysian industry has accredited the Green Building Index (GBI) as the tools for buildings to enhance the sustainability and educate awareness among the developers, architects, engineers, planners, designers, contractors and public on environmental issues and our responsibility for incoming generations and using resources efficiently. These efforts will create a new challenge for the Malaysian construction industry to embrace sustainable development while at the same time providing affordable green building quality and reducing impact on environment.

Sustainable design is a philosophy of interior, physical or product design which needs to take into account how the item will perform its intended functionality in an efficient, safe and reliable manner with complies with principles of ecological sustainability (Albert Ping et.al.,2017; Isa, et al., 2014). Actually sustainability is not considered as a new concept as it was used since the 1970's. The term and concept of sustainability are actively redesigned for the specific purpose at any given time and context. In construction industry, a variety of sustainable based concepts are used such as sustainable and green building, sustainable and green construction and sustainable and green project. While sustainability practices in Malaysia, the government has realized the importance of saving the environment through sustainable building development especially toward reducing carbon emission and resources use. In addition, many efforts to realize sustainability in building have been implemented in the country. The concept of sustainability also been incorporated in the design of several government office buildings such as LEO (Low Energy Office), GEO (Green Energy Office) and Diamond Buildings which provide a platform for resistant of the concept in driving forward the sustainability goals of the Malaysian building Industry.

According to (Yiing, Yaacob, & Hussein, 2013), in Malaysia, the sustainable related with Green Building rating system was launched in May 2009, corresponding to the national policies on the environment and technology which designed based on other international rating systems such as BREEAM (Building Research Establishment Environmental Assessment Method) and the USA's LEED (Leadership in Energy and Environmental design). Hence, the goal of this study was to investigate the design building components, as well as energy and environmental systems for the building. Some literature review about Green Building Index Rating which includes building

codes, relevant legislation governing the consumption resources and emission of environmental pollutants by building has been use as a guideline to conduct this case study. From the review Polo Residence has been choose as a place to conduct this study. Polo residence is a new residential. Centrally located in an exclusive and sought after the middle of Ipoh. Polo Residence also have great accessibility to a wide variety of shopping, entertainment and services. The Royal Perak Golf Club and Polo Ground are nearest with the building. This building has a criteria indicate to the Sustainable Building with Green Building Index Rating based on the six main criteria's of Energy Efficiency, Indoor Environment Quality, Sustainable Site Planning & Management, Materials & Resources, Water Efficiency, and Innovation.

METHODOLOGY

This section describes the methodology that will be used during the study. It is essential to choose the appropriate method because it will assist a smooth running of the study. The case study adopted in this research can help to focus and study more in detail on a specific construction site. Methods for collecting data and information of the case study are site visit and open interviews.

Data collection were done using qualitative approached whereby an observation and interviewed session was conducted with the supervisor of the building. Qualitative research is use to gain an understanding of underlying reasons, opinions, and motivations. It provides an understandings into the problem or helps to develop ideas for potential quantitative research. It is also used to uncover trends in thought and opinions, and dive deeper into the problem. Qualitative data collection methods vary using unstructured or semi-structured techniques. Some common methods include in-depth interviews with individuals, group discussions, diary and journal exercises, and in-context observations. Sessions may be conducted in person, by telephone, via videoconferencing and via the Internet. The sample size is typically small, and respondents are selected to fulfil a given quota.

For this study the observation was done on the building and photo were taken. After that semi structure interview were conducted to gain more information on the building regarding sustainable design. All data gathered was analyzed manually using thematic analyses and coding. Later all analyzed data were been compared with Green Building Index (GBI) requirement.

FINDING

The information gained from interviews and observations at the case study building were categorized as Residential Existing Building (REB). All the information been compared with Green Building Index (GBI) category which divided into six criteria.

Assessment Criteria for Non-Residential Existing Building (NREB)
a) Energy efficiency (EE)

PART	CRITERIA	ITEM	SCORE		
	EE	ENERGY EFFICIENCY	YES	NO	NOT SURE
	EE1	Minimum EE performance			✓

4.1	EE2	Renewable Energy		✓	
	EE3	Advanced EE performance based OOTV and RTTV	✓		
	EE4	Home office and connectivity	✓		
	EE5	Sustainable maintenance			✓

These buildings are using censored lighting at the parking spot to provide the right amount of light where and when it is needed. Furthermore, by placing the reflective mirror box at the basement parking spot will reduce the electrical energy used in the building. This will maximize the usage of natural daylighting and increase the energy efficiency. Since the building is location is near to public access and located at urban area, internet connectivity is really fast and accessible through the building.

Location of reflective

Daylighting using reflective mirror

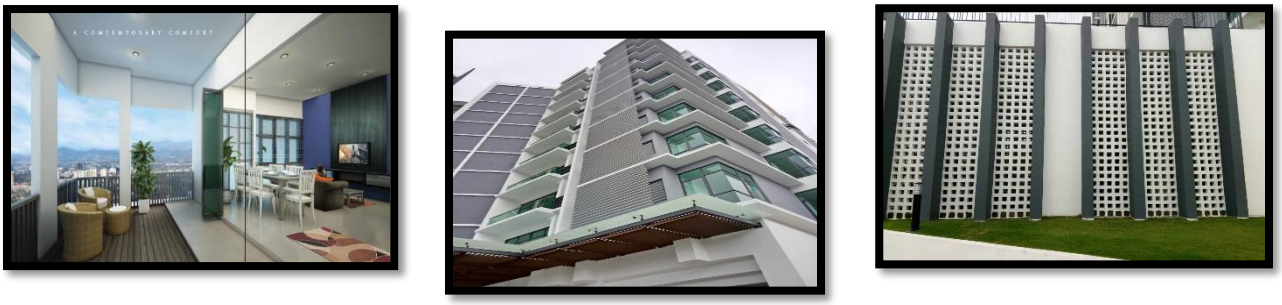
Sensored lighting at the basement parking

b) Indoor environmental quality (EQ)

PART	CRITERIA	ITEM	SCORE		
	EE	**INDOOR ENVIROMENTAL QUALITY**	YES	NO	NOT SURE
4.2	EQ1	Minimum IAQ Performance			✓
	EQ2	Day lighting	✓		
	EQ3	Sound Insulation	✓		
	EQ4	Good Quality Construction			✓
	EQ5	Volatile Organic Compounds	✓		
	EQ6	Formaldehyde Minimisation			✓

This building provided ample window space in each of the units. The windows are argon filled, double glazed and have a low-emissivity coating for helps to reduce glare and thermal performance increase. About 90% percent of window structure is glass. This window not only allow natural day light to enter the unit but it will reduce the need for electric lighting. Ventilation Block Wall provided at Car Park. The function of ventilation block wall is not only for harmony and aesthetics displayed but to allow natural day light to enter the unit.The energy for air-conditioning and lighting can be cut down through the innovative use and implementation of Concrete Screen Block. For this building Reinforced Concrete Wall has been used among the unit in the building.

Reinforced concrete wall has proven that it can reduce the transmission of sound effectively such as audio systems from the other side or out of the building. Innovative composite systems, combining the performance of concrete with other materials, can economically achieve levels of sound insulation performance far exceeding the minimum required by the Building Code of Australia (BCA), enabling even the most stringent sound insulation requirements to be satisfied.(Cement Concrete & Aggregates, 2009). Polo Residence try to reduce the use low emitting materials that will reduce the amount of volatile organic compound that will affect occupant's well-being .Low emitting paints, coatings, and sealants is selected to be used during the construction phase. It is for reduce the air contaminants quantity that are irritating, odours and harmful to the comfort and well-being occupants and installer



Day lighting applied in the building mirror box

c) Sustainable site planning & management (SM)

PART	CRITERIA	ITEM	SCORE		
	SM	**CONSTRUCTION MANAGEMENT**	YES	NO	NOT SURE
4.3	SM5	Construction System And Site Management		✓	
	SM6	Storm Water Management	✓		
	SM7	Re-Development Of Existing Sites And Brownfield Sites		✓	
	SM8	Avoiding Environmentally Sensitive Area	✓		
	SM9	Building User Manual			✓

Management of building a building can be done without any planning and construction scheduling. Planning and scheduling is implemented when documents and charts are available that help managers or contractors complete construction projects. Generally, construction management is a service that uses project management techniques in particular to manage the planning, design and construction of a project from start to finish. The purpose of this construction management is to control the cost, time and quality of the project.

For the storm water management, this building use the concept of Urban Water Management for Malaysia (MSMA) which is surrounded buildings are placed with concrete design with lines to manage runoff surfaces. For Avoiding Environmentally Sensitive Area development of inappropriate sites and reduces the environmental impact from the location of building on a site, Polo Residence is located near infamous Polo Grounds which makes the condominium close to a wide variety of amenities.

Storm Water Management

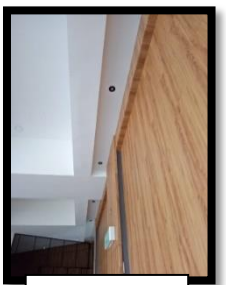
d) Materials & resources (MR)

PART	CRITERIA	ITEM	SCORE		
	MR	**MATERIAL AND RESOURCES**	YES	NO	NOT SURE
4.4	MR1	Material Reuse And Selection	✓		
	MR2	Recycled Content Materials			✓
	MR3	Regional Materials	✓		
	MR4	Sustainable Timber		✓	
	MR5	Storage And Collection Of Recyclables		✓	
	MR6	Construction Waste Management			✓

In the building structure, the material they used for structure is reinforced concrete structure. Besides that, the material for windows is Powder Coated Aluminum Framed Glass Panel Window. Aluminum is the one of the highest recycling rates of any metal and an environmentally sustainable material.

This building using load bearing wall (in-situ concrete) for all structure building except toilet wall using a brick wall. The material used for create ceiling is plaster ceiling and for the finishing they used Skim Coat & Paint. Skim Coat & Paint for ceiling can reduce carbon footprint and lower your environmental impact. For this building the roof using reinforced concrete flat roof. Using reinforced concrete flat roof can reduce the height of the building. For the floor in this building using a ceramic tile.

Window



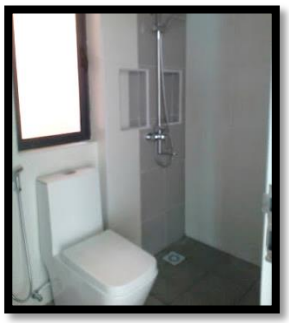
Ceiling

Flat Roof

e) Water efficiency (WE)

PART	CRITERIA	ITEM	SCORE		
	WE	**WATER EFFICIENCY**	YES	NO	NOT SURE
4.5	WE1	Rainwater harvesting	✓		
	WE2	Water recycling		✓	
	WE3	Water efficiency landscaping	✓		
	WE4	Water efficient fittings	✓		

To more precisely estimate the quantity of water actually consumed by a given green building, the factor of operating time was added to the building categories when estimating the baseline for the quantity of water consumed.



Rainwater harvesting is a process or technique of collecting, filtering, storing and using rainwater for irrigation and for various other purpose. Rainwater harvesting also have been covered by PE sheet that is excellent float age and great water resistance without moisture absorption. PE Sheet which is known as Polyethylene Sheet is made of polyethylene film (PE) as backing material and fine touch feeling, lightweight properties allow for high efficient and easier working.

Water-efficient landscaping produces attractive landscapes because it utilizes designs and plant suited to local conditions. The benefit of using the water efficiency landscaping is group plants will according to their water needs and will use native and low water use plants. Besides it will produce lower water bills form reduced water use and directly will reduced landscaping maintenance costs.

Water efficient appliances and fixtures can save a lot of water and money in long term. It also is encouraging a healthy water consuming habit among consumers and motivated the introduction of cost effective and water efficient technologies. Furthermore, it will stimulate the adoption of efficient and effective water-use technologies and use of water efficient product as part of contributions towards green environment.

f) Innovation (IN)

PART	CRITERIA	ITEM	SCORE		
	IN	**INNOVATION**	YES	NO	NOT SURE
4.6	IN1	Innovation In Design & Environmental Design Initiatives	✓		
	IN2	Green Building Index Facilitator (GBIF)			✓

The scenery in front of Polo Residence is also one of the landmark for visitors who navigated the area. Moreover, the gates has been an attractions for people who interested in buying the residence. Thus, the gates also equipped with environmental friendly system which use timer for the sprinkling process.

Besides that, this building also uses a smart card or access card. The use of this smart card was to touch the card as soon as it enters the elevator, and the card system will operate, the elevator will stop directly at the residence level according to the address registered to the condominium management side. Commenting further, he said, besides helping to solve the problem, it could also prevent the occurrence of criminal cases in the home. Indirectly, it will provide better safety to the residents in the condominium.

In our research, we find there were a garbage collection centre that has been provided outside the building area. Most of the garbage will be collected by recycle agencies. Each type of waste comprising papers, glass bottles and used metal will be sent for recycling.

The attraction view at Polo Residence building & the security and CCTV

DISCUSSION AND CONCLUSION

Through the analysis, the data indicate that there are some elements in Polo Residence followed Green Building Index (GBI). Observations shows that this Polo Residence's building are using censored lighting at the parking spot to provide the right amount of light where and when it is needed and the building used the reflective mirror box at the basement parking spot to reduce the electrical energy used in the building. This maximized the use of natural sunlight and increased energy efficiency.

As for Indoor Environmental Quality, the building provided ample window space whereby in each of the glass window were argon filled, double glazed and have a low-emissivity coating to reduce glare and increased thermal performance. Besides that, Ventilation Block Wall provided

at car park which is not only for harmony and aesthetics displayed but to allow natural day light to enter the unit. This building used the concept of Urban Water Management for Malaysia (MSMA) whereby the buildings are placed with concrete design which can manage surfaces runoff. This building was located near upright Polo Grounds which makes the condominium close to a variety of amenities. In addition, Polo Grounds was also adjacent to a friendly environment area equipped with nature friendly landscape.

Reinforced concrete structure, Powder Coated Aluminum Framed Glass Panel Window, Skim Coat & Paint and ceramic tile for flooring were used as a main materials for the building. All material are sustainable and has the highest recycling rates. The building also used smart card or access card system for elevator whereby the elevator will stop directly at the residence level according to the address registered to the condominium card system.

However, the finding obtained from this study shows that this building are not fully sustainable according to Green Building Index criteria. Making buildings a sustainable and environmentally friendly needs different inputs and expertise from different stakeholders at different stages of the building life cycle. All parties of stakeholders need to work together in implementing GBI. Clearly, there is a need of technologies and tools in decision making in achieving sustainable building in Malaysia. An introduction of GBI by the government was a good step in implementing sustainable development. Local to global initiatives and facilitate collaboration and knowledge sharing between research organizations and role-players in the industry need to be strengthen and most importantly, organizations must possess adaptive capacity that enables them to recognize the need for change and to respond to it appropriately.

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