

A REVIEW ON CASE STUDIES OF OFFICE BUILDING FACADES IN MALAYSIA BASED ON MAQASID SYARIAH

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Abstract

Malaysia is ranked at the 56th place in the Climate Change Performance Index (CCPI) after gradually falling from the 39th place in 2016. The CCPI is useful in assessing the climate change performance of 57 countries including the European Union. With the intention of mitigating negative impacts on the environment due to the emission of harmful substances, the Sustainable Development Goals (SDG) have been developed by the United Nations General Assembly back in 2015. Thus, green development that fulfils the Green Building Index (GBI) criteria is important as guidelines in designing and developing buildings which are suitable to Malaysia's tropical climate, environmental & developmental context, and cultural & social needs. In addition, it helps in tackling the issue of climate change in Malaysia. The objective of this paper is to investigate the façade performance of green office buildings in Malaysia based on GBI criteria. Besides, this paper was conducted to explore the matrix assessment on GBI criteria along with Maqasid Syariah principles. Through this study, it is verified that the façade designs that satisfied the GBI criteria in Malaysia are in-lined with Maqasid Syariah principles.

Keywords: *building facades, material, maqasid syari'I, daylight.*

INTRODUCTION

The global warming effect that the world facing has increase the outdoor an indoor temperature. An increase in the outdoor and indoor temperature is one of the impacts of global warming which are faced by the world today. Malaysia is a hot and humid tropical country that lies between 1 and 7 north latitudinal and 100 and 120 east longitudinal, which also affected by the global warming issues. Thus, material and green element fundamental needs to be considered at the early phase of design. The

department of Standards Malaysia (DOSM) (2001) recommended the indoor design temperature range from 23°C to 26°C with relative humidity 60-70%. The existing of facades has been proved to control the humidity and receiving heat or glare from the outside as to maintain the comfort of the occupants in the building.

Facades is the exterior wall or face of the building, it is depending on architectural style, which have some tall and imposing with massive doorways and towering spires or welcoming with large porch or wide window. (Schittich, 2012) state that the facade should not be treated only as a decorative layer but also as a responsive skin. This idea was extend and suggested that the building facades should be treated not as a skin but also as a system that interacts with the whole building. Building service system which gives huge range of functions and influence factor for the energy demand.

Malaysia is already a developing country experiencing rapid urbanization (Hong et al., 2019) that needs to review its existing buildings focus on green development and determine an appropriate direction for its construction industry to meet sustainability goals. As mentioned the appearance of building is mostly the issue of evaluation and influences the facade image and architectural quality (Askari, 2009). As mentioned earlier, the appearance of a building is the major issue in evaluating and influencing the facade image and architectural quality. This paper reviews on the green office building in Malaysia, where the efficiency is put into focus and to be evaluated according to the Green Building Index (GBI) criteria along with Maqasid Syariah principles.

FAÇADE ISSUE

Facade is the face of the building that shows its value and structure (Huxtable, 2004). It is the connection between inner and outer space (Navarro et al., 2004) that imposes considered impact on the city image (Askari, 2009). The interface between the interior of the building with the building outdoor environment component that serve as thermal barrier plays an important part in determining the amount of energy necessary to maintain a comfortable indoor environment relative to the outside environment.

The interaction between the building interior and exterior building components serves as thermal barrier which plays an important part in determining the optimum amount of energy to maintain a comfortable indoor environment relative to the outside environment. Building alignment and WWRs are factors that can affect

facade performance and overall building energy consumption, and they considered during the conceptual design of building.

In designing the building facades there are certain issues that need to be considered which is the installation, orientation, material, and the climate changes which to avoid the facade failure. According to (Aksamija, 2013) there are two broad categories of facades such as glazed facades which are transparent glazing material constructed mostly within metal frame, and opaque facades that made from sturdy materials such as concrete and steel. It's also may have punched-hole openings and windows. Moreover, the facades design based on the sustainable guidelines from the GBI criteria are considered to sustain the environment as well as the climate condition.

Sustainability

Sustainability is about improving the quality of human life while living within the supporting ecosystem. The sustainable performance of buildings and the responses towards the local climate should be the important factors in design. According to Stansfield (Stansfield, 2001) building sustainability could be achieved through building facades by reducing environmental impacts on building as well as building impacts on the environment. Facades as the linkage between the interior of the building and the external environment which can reduce the level of heat and cooling energy needed in the building. Refer to the fundamental in optimizing daylight harvesting by building facades in hot and humid climate such as Malaysia (Tang, C. K., & Chin, 2013) there are certain elements being highlighted such as:

- Solar heat gain reduction
- Glare control
- Deep daylight penetration
- Uniform daylight distribution

The major elements mentions are related and effect the daylight performance which is a one of the sustainable components to be considered in facades design.

Daylight

Daylight has been considered an important component in the development of architecture (Phillips, 1997). Additionally, daylight was key driver of energy sustainability in residential as well as commercial building, with energy saving. In study shows that the sky condition in tropical country is intermediate (Lim, 2014). As mentioned by (Manso & Behmiri, 2013) renewable energy such as solar, are cleaner and inexhaustible energy sources and become key sources on sustainable

development providing a safe way to utilize resources for current and future generation.

In 2000, the LEED rating system were introduced by U.S Green Building Council (USGBC) to standardize metrics for several primary sustainable design characteristic include daylight. Unfortunately, the comparisons of daylight performance still cannot be done until 2013, when the Lighting measurement 83 (LM-83), approved methods were introduced: IES Spatial Daylight Autonomy (sDA) and Annual Sunlight Exposure (ASE) were published and adopted by Illuminating Engineering Society (IES). Optimal use of daylight plays a critical role in sustainable building fundamental because its free and renewable source. Daylighting, shading and lighting control strategies can provide a natural lit and cost-effective building.

The common design that related to the natural light are, windows, skylights, light shaft, atriums, and translucent panels. This element sources if carefully considered in building design help maximizing natural light while maintaining indoor temperature and reducing the light glare. In the holy Al-Quran, surah An-Nur emphasize on daylight where ayah 35 exemplify God as light in a lamp. The light guides human towards betterment in life. The existing of light that mention to creates better life was one of the Maqasid Shariah criteria on protection of life.

MAQASID SYARIAH

Maqasid Syariah happens to be absolute goal in the Islamic law which has made and deduced by Muslims jurists based on the guidance from verses in the Quran and Sunnah. In order to create and set a system value, Quran and Sunnah are very essential in forming a justly and balanced society, (Akhtar, 1996). Theory of Maqasid Syariah has evolved and has been noticeable ever since the 4th century until the 7th century after Hijrah. According to a twelfth theologian, Abu Hamid al Ghazali (d.1111), who was first came up with the conceptual idea concerning the five major aspects of human life, namely (Chapra et al., 2008); (Kamali, 2008) protection of life, religion, intellect, progeny, and property as below:

Principles of Maqasid Syariah	Objectives in Life
Protection of Life/ Self	Covers the greatness of Allah (SWT), the Creator, who creates human beings as the caliphs of the Earth that also responsible to sustain and maintain the benefits of humankind as well as the environment.

Protection of Religion	Covers the presence of the Creator of the universe in everything that humans do, and all human doings are supposed to follow to the teachings outlined from the Quran and the Sunnah.
Protection of Intellect	Gaining knowledge and analytical capabilities (Intellectual skills) in comprehending what's right and what's wrong for purpose of obtaining Allah's blessing.
Protection of Progeny	Acknowledge and value the mutual and instinctive nature of humankind for having family life, plus educating the newer generations to do only the good and avoid doing the bad, which are also encompassed in the Islamic teachings to produce a upright and friendly neighborhood.
Protection of Property	Obtaining, saving, sharing, and sustaining one's wealth on regards to the Islamic Muamalat for a blessed live through good value of money and wealth.

Table 1 Principle of Maqasid Syariah

Planning, designing, proper management, sustaining and monitoring the practicality as well as the aesthetic value in design of built environment are the responsibility that are in need to be contemplated and focused on the field of built environment. Sustainable development should not be something new for Muslims since we have the Quran and the Sunnah that were brought, provided to us the guidance for humanity's welfare whether spiritually or physically. Besides that, based on the guidance from the Quran and the Sunnah, we are also reminded with warnings on squandering and wastefulness in consumption of the Earth's natural resources (Aburounia & Sexton, 2006).

In Malaysia, there are collaboration between the Malaysian Institute of Architects (PAM) and the Association of Consulting Engineers Malaysia (ACEM) was very fruitful in developing an environmental rating system for buildings in Malaysia, called Green Building Index (GBI). In GBI there are 6 major criteria that need to be fulfilled in evaluate the green building performance [2] such as:

- Sustainable site planning and management
- Material and resources
- Energy efficiency
- Indoor environment quality
- Water efficiency
- Innovation

This is the first complete and comprehensive environmental rating system in Malaysia, and it is developed to suit the Malaysian tropical climate, environmental and developmental setting, cultural and social requirements. The 6 criteria related in life and environment protection that also mention in Maqasid Syariah Principles. Proper design of green building facilities in conserving energy and natural resources, which reducing the emission of harmful substances into the atmosphere. Thus, the GBI acts as a tool in evaluating a building whether it fulfils the criteria of a green building. There are similarity that relate the criteria of GBI and Maqasid Syariah principle. Henceforth, the matrix organization below shows the relation between GBI criteria and Maqasid Syariah principles.:

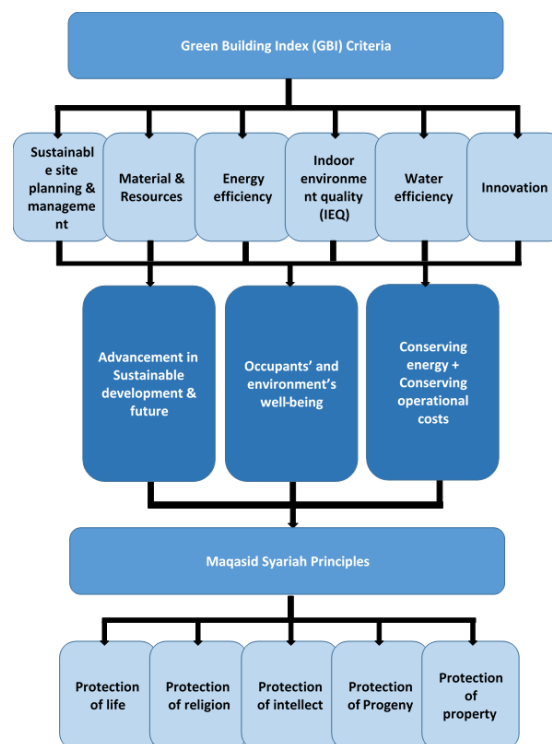


Figure 1. Relationship between GBI criteria [2] and Maqasid Syariah principle (Auda, 2015)

METHODOLOGY

This paper employs qualitative method research in providing an elaboration on facade designs of green office buildings in Malaysia, which satisfied the GBI criteria as in-lined with the ideology of Maqasid Syariah as well as its principles. Case study on Malaysian office building were done to evaluate the efficiency of the facade towards the building and environment. Moreover, the sustainable design criteria based on GBI are very much related and in-lined with Maqasid Syariah principles, which are Protection of life, religion, intellect, progeny, and property. There are three office building that were selected in analyze the facades efficiency, which is Angkasapuri, Diamond building and Petronas twin tower. These three-office building were

constructed using curtain and glaze window which also other facades system design as below (Table 2).

Firstly, a case study was conducted on the Angkasapuri building. It is found that the building was constructed with the facade projection design, which acts as a fixed shading device. The facade projection limits the amount of the sunlight fenestration into the building. The existing perforated elements on the building walls behind the facade projection allows the building to have proper natural ventilation which assists in reducing heat gain.




Building	Design type	Facade design	Function
Angkasapuri	Facade projection	 <p>-stone facades: Brick masonry curtain wall</p>	<p>-Facades projection as the 'shield' which limit the amount of sun passingthrough penetration into the interior.</p> <p>-Aligned with the passive solar architectural design that utilizes overhangs/ projection to restrict directsunlight.</p>
Diamond building	Double glazing / tilting facades	 <p>-Glazing facades: double glazing curtain wall</p>	<p>-Utilization of glazing thermalproperty to restrict the heat transmission</p> <p>-Utilization of tinted film on theglazing</p>
Petronas twin tower	Fully clad facade	 <p>-steel curtain walls</p>	<p>-Utilization of metal / foam board cladding for protection and insulationfrom solar radiation.</p> <p>-Enhancement of corporate image</p>

Table 2. Facades in Malaysia (Halawa et al., 2018) and (MH & AH, 2017)

Thus, the facade was designed with hollow spaces which allow air ventilation from the outside and optimum amount of sun fenestration into the building. The reflection and refraction of sunlight also take place in this building and due to materials used in the construction and positioning of the building facing towards

the West, the glare can be reduced. As shown in the figure below, the orientation of the building also plays an important element in promoting a building that employs passive green design:

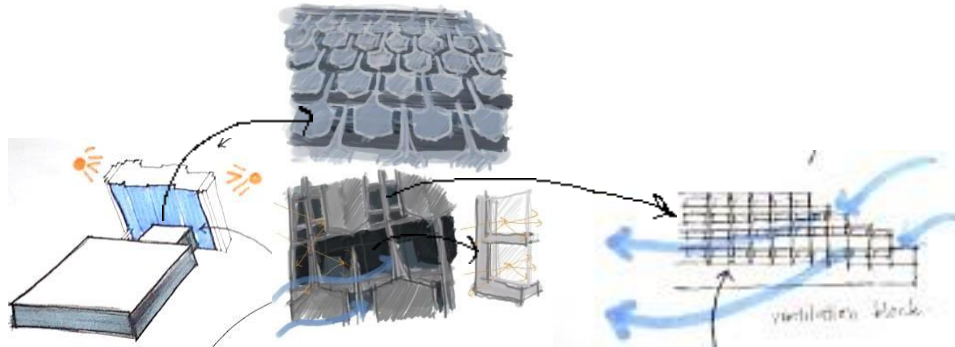
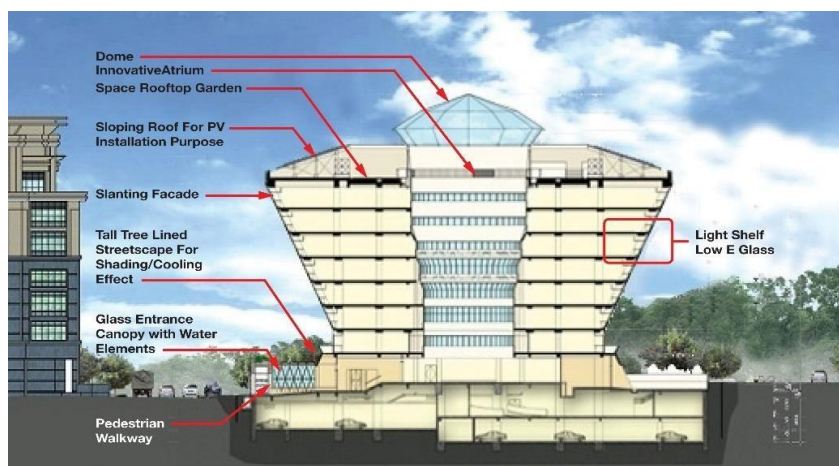


Figure 2. Facades in Malaysia (Halawa et al., 2018) and (MH & AH, 2017)

The orientation of the building is one of the strategies to control the sunlight exposure/penetration. Moreover, it adopts on of the sustainability strategies that is related to the GBI criteria, which are "the sustainable site planning and management", "material and resources", "energy efficiency", "indoor environment quality", and "innovation".

Besides that, the second case study was on the Malaysian Energy Commissioning building or better known as the Diamond Building. This building was



constructed by utilizing double-glazing and tilting facade design. The building obtains 50% of its daylight needs from natural lighting. [3] The Crown building which is the diamond-dome skylight is made up of laminated tempered glass. It is located within the dome space with fixed blinds that also filter and diffuse daylight to provide even and glare-free daylighting into the office around the atrium as shown below:

Figure 3. Source energy commission official website (2021)

The glass facades is installed with low emissivity glass (low e-glass) that is reflective on the outside, allowing daylight to penetrate the building and minimizing heat from the sun. This design follow the climate and environment of the site which is also fully covered the whole GBI assessment. Thus, it was a platinum building design in Malaysia.

Thirdly, the case study are Petronas twin tower which constructed with full clad facades. (Halawa et al., 2018) The facade system employed for the building, where it is fully covered with metal framed structures and curtain walls. The exterior facade of the building is made up of aluminum glass with stainless steel panels, which brings a tremendous light effect from the sunlight as it changes throughout the year[1].



Figure 4 Slide share, Petronas Twin Tower 2016

The Petronas Twin Towers were constructed and comprised with a system which flawlessly synchronizes the power supply, telecommunications, lighting, fire and smoke control, building security as well as environmental control. (Petroski, 1996) Thus, Petronas Twin Towers building astonishingly capable to cancel heat along with UV rays with the assist of green laminated glass over the twin towers' surface.

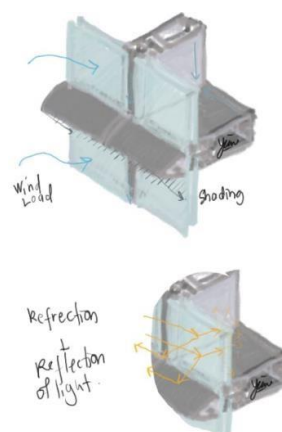


Figure 5: Refraction and reflection of light on curtain wall, source author

Moreover, to filter excessive lighting and minimize noise, specialized panels were also installed to the exterior of each tower which is called, vision glass. In addition, the vision glass is very useful in providing occupants with comfortable indoor environment. Plus, there are as well stainless-steel visors which sheltered the vision glass so that it can shield occupants from the hot, tropical climate (Thornton et al., 1997).

From the case study there are several elements that are important to be evaluate in designing a high-rise office as it more than 7-10 storeys which at least 35.0 m tall. Thus, the building design in Malaysia consist of green element which focus on the usercomfort. The material of the building creates a posible value in a way to tackle the building efficiency and the user comfort. The element of materials selection in building construction also help in control the climate change in Malaysia.

RESULTS AND DISCUSSION

Based on the data obtained from the three case studies, the criteria of green development are essential as guidelines in designing the building facades. Moreover, the green building assessment based on the GBI criteria are also related closely to Maqasid syariah principle, which provide protection in many aspects of humans' well-being and sustenance in the ecosystems. Firstly, Angkasapuri that use the facades projection to tackle the glare and heat consumption issues. The facades design assist by sustainable criteria which protect the building from direct solar radiation through the shading device and at the same time allow the natural ventilation and natural light into the building. Heat transfer through facades follows basic principle of physics which is flows from higher to lower temperature. The rate of heat transfer through building skins depends on the difference of the interior and exterior capacity of the facades to control the heat flow.

Secondly, the case study of Diamond building analysis in that refer on the article by (MH & AH, 2017). This article analyse the green building index tools that influence the Indoor Environmental Quality (IEQ) performance. Diamond building were certified by the GBI tools assessment which were related to the Maqasid Syariah Principle. In the article mention the mean radiant temperature, indoor air temperature, and velocity as below:

Parameter	Reference	ST	Finding summary
Temperature	23C – 26C	22C – 25C	Within Range(good)

Relative Humidity	55% - 70%	50% - 59%	WithinRange (good)
Heat Flux	Not exceeding 50W/m2	22W/m2 – 26W/m2	WithinRange (good)

Figure 6 table analysis of diamond building (MH & AH, 2017)

A presumption can be made that with considering sustainable and Maqasid Syariah Principle in facades design may help achieve the comfort inside the building. Thirdly, the KLCC were design at a specific environment which develops as a joint venture of the private and public sectors. The facade elements of the KLCC towers portray an image of a modern and collective of Malaysia. Thus, (Kozlowski et al., 2015) mention that KLCC Twin Tower have been designed to address the local climate and include traditional local motifs and features. The facade was installed with fully glazed curtain walls and aluminum frames act as the shading devices. The holistic approach in the research considered the facades design option attaining the building sustainability.

Regarding the three case studies, each building satisfied the GBI criteria to be categorized as green buildings. Moreover, since the intention of fulfilling the GBI criteria in achieving the sustainable development goals proves that green building design and green development do comply to Maqasid Syariah principles. As the GBI criteria function to diminish the building impact on the occupant's well-being and the environment throughout the building lifespan, contribute to saving operational costs, boosting productivity of users' at workplace as well as sustaining the ecosystem locally and globally. Therefore, Maqasid Syariah principles "Protection of life", where the occupants' well-being is secured, therefore, occupants will remain healthy and comfortable with the optimum indoor environment quality of the building is attainable.

Besides, "Protection of religion and intellect" are also achievable as the teachings based on the Quran and Sunnah are being implemented as the caliphs on the Earth in translating the teachings into developing innovations and skills in sustaining the natural resources as well as the environment. In addition, "Protection of progeny" is also obtainable since the Earth and its resources is sustained so that, future generations acknowledge and value the instinct of having well-balanced community to continue their lineage in greener, sustainable ecosystem.

Finally, "Protection of property", as satisfying the GBI criteria will contribute to reduction in operational costs as passive designs are being employed in buildings, the costs in meeting occupants' comfort for heating or cooling, lighting can be

minimized and controlled, thus, longer building lifecycle with less impacts on building users' as well as the environment are guaranteed.

CONCLUSION

All in all, based on the outcomes of the study, it is verified that the GBI criteria fulfilled by the green office buildings interrelated with the Maqasid Syariah Principles. The case studies demonstrated that the needs of green elements and passive design in designing phase are vital in satisfying the users' comfort along with protecting the environment. The various wall facade of double glazing with either horizontal or vertical shading device and curtain wall did not show drastic effects on indoor temperature. The purposes of fulfilling the GBI criteria in one's building is to encourage the industrialization of buildings in Malaysia towards the advancement insustainable development.

However, the Maqasid Syariah principle were broad knowledge and can also apply as a guideline in maintaining the harmonies of environment and building development. The overview from the various literature highlight the implemented approach policies in green buildings criteria. Thus, it help in relating the criteria and policies to the Maqasid Syariah principle. There also primary findings of this study include:

1. Monitoring the design of building facades according to Malaysian standards as well as complying with the Green Building Index (GBI) criteria.
2. Review on the case study of the glass facades office in Malaysia.
3. Relationship between GBI criteria in assessing green buildings' facade performance and the compliance with Maqasid Syariah principles.

As summary, it can be concluded that, this research is useful in understanding thefacades elements and the criteria of Maqasid Syariah in green design.

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