

# GBI assessment checklist: Level of awareness of the contractors in the Malaysian construction industry

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**Abstract.** Malaysia has developed Green Building Index (GBI) as the green rating tool for buildings and townships to encourage sustainability in the construction industry. Understanding the roles and tasks of a contractor is essential in accomplishing the GBI assessment on a green building project. However, there are challenges in adapting the GBI. The objective of this paper is to identify the knowledge of contractor for each area of assessments in GBI's checklist. Data were collected through the questionnaire surveys to the selected contractors, which were involved in GBI projects. The findings revealed that most of the respondents agreed and acknowledged the impact of each criterion in the assessment. Thus, it is highly recommended to educate and change the public perception on the awareness of the green building. Aside, more research and development (R&D) process should be encouraged to accelerate the GBI certificate implementation in the construction industry. In conclusion, proper education training, more legislative and financial framework are essential for the future of green building projects.

## 1. Introduction

The ideology of environmental sustainability and the new paradigm of 'sustainable human development' are already spread in Malaysian construction industry in last few years. In accelerating sustainability awareness to the industry, the government of Malaysia introduced the Eleventh Malaysia Plan. In 2016, the Construction Industry Development Board Malaysia (CIDB) has established the new construction plans, which is Construction Industry Transformation Programme (CITP). One of the primary objectives of CITP is to integrate an environmental sustainability to the construction processes [1].

There are lots of fundamentals to encourage the implementation of GBI. For example, any of green building projects requires a systematic management and proper operation activities. Cooperation with many specialists and experts are also needed to upsurge the success of green building projects. Thus in 2009, the Malaysian Institute of Architects (MIA) and the Association of Consulting Engineers Malaysia (ACEM) introduced a corporation: The Green Building Index Sdn. Bhd. The main objective of this corporation is to enhance the implementation of GBI in Malaysia while considering the fundamentals in implementing GBI [2].

This paper is intended to identify the knowledge of a contractor for each area of assessment in GBI's checklist in the Malaysian construction industry. This study is also anticipating to accelerate the GBI certificate implementation in construction sector. It is significant to educate and change the public perception on the awareness of the green building and encourage the R&D process. Furthermore, it is also essential to provide a proper education training, more legislative and financial framework for the future green building projects.



## 2. Green Building Index (GBI) certification

GBI is used as the ordinary tool in exercising any green building development in Malaysia. Towards the end of development, the green building project will receive the GBI certification. Thus, this shows that GBI plays a major role in enhancing the sustainable development in Malaysia as the certification of GBI is recognised internationally. This practice does not only provide the advantages to the environments and eco-system, , but to the economics of the country too [3].

GBI is created to develop the green construction practical assessment for the tropical weather, environmental and development context, cultural and social needs. The GBI assessment is intended to describe green buildings by creating a standard measurement; encourage cohesive whole-building design; recognise and reward environmental leadership; transform the already built environment to decrease its environmental impact; and ensure new buildings keep on pertinent in the future, and existing buildings are refurbished and upgraded properly to remain relevant [2].

## 3. Methodology

This paper concentrates on the knowledge of contractor for each area of assessment in GBI's checklist. A questionnaire survey is conducted to collect the quantitative data. The respondents of this survey are the construction companies that register with the CIDB under class of G7 categories and, which are involved with GBI projects. The survey uses a 5-point Likert scale, which range from 1 = strongly disagree to 5 = strongly agree. Thirty out of one hundred questionnaires were returned, making the complete response rate of thirty percent (30%).

## 4. Data Analysis and Findings

This section discusses findings from the questionnaire surveys regarding the level of awareness of GBI checklist among the contractors in the industry

**Table 1.** Analysis of Level of Awareness of GBI checklist among the Contractors

Item	Level of Awareness	Average index	Rating
<b>Energy Efficiency (EE)</b>			
1	Reducing the energy consumption in building	3.67	1
2	Implementing the building integrated photovoltaic as the building envelope	3.33	3
3	Reducing the usage of the air-conditioning in building	3.67	1
<b>Indoor Air Quality (IAQ)</b>			
4	Increasing of living quality and wellbeing of occupants	3.67	1
5	Achieving the usage of low volatile organic compound material, operation of quality air filtration, appropriate control temperature, movement, and humidity of air	3.33	2
<b>Sustainable site planning and Management (SM)</b>			
5	Considering the site selection and planning, access to the area of neighbourhoods, and the landscape in the perimeter area	4.00	2
7	Reducing the materials and wastage through the appropriate site management	4.00	2
8	Providing the storm water management and avoiding the environmentally sensitive areas	4.33	1
<b>Material and Resources (MR)</b>			
9	Focusing on the selection of the construction materials and waste management in site	3.33	3
10	Utilising products and wastage of recycling content of materials as the primary element	4	1
11	Implementing appropriate waste management through the concept of reduce, reuse, and recycle (3R)	4	1
<b>Water Efficiency (WE)</b>			

13	Recovering the water which diverted to the waste system and cleaning it to be reused in portable water consumption	4.33	1
	<b>Innovation (I)</b>		
14	Developing creative ideas in the element of the construction	4.33	2
15	Involving the innovation elements	5.00	1

Source: Adopted and modified from Muksain (2017) [4]

Based on Table 1, the perspective and understanding of contractor for each of the criterion stated in GBI assessment was evaluated. All the respondents have good knowledge about the checklist. For instance, the EE's criterion, the respondents agreed that the impact of EE was reducing the energy consumption in building and lessen the usage of air-conditioning, and the criteria received 3.67 as the average index. Meanwhile, the implementation of the building photovoltaic as the building envelope in the green building received the moderate understanding among the respondents.

The respondents agreed on to improvise the living quality and wellbeing of the occupants. The impact of this IAQ's criterion received 3.67 as the average index. Meanwhile, achieving the usage of low volatile organic compound material, an operation of quality air filtration, appropriate control temperature, movement, and humidity of air received only 3.33 as the average index from the respondents. Several of respondents acknowledged that SM's criterion must provide the storm water management and avoid environmentally sensitive areas in any of green building project. Furthermore, considering the site selection and planning, access to the neighbourhood's area, and the landscape in the perimeter area received an excellent understanding among the respondents. This criterion of reducing the materials and wastage through the appropriate site management had drawn 4.00 as the average index. Utilising products and wastage of recycling content of materials and implementing appropriate construction waste management through the concept 3R drawn a good understanding and received 4.00 as the average index among the respondents for the MR's criteria. Furthermore, focusing on the selection of the construction materials and waste management in site received 3.33 as an average index.

For WE's criterion, with an average index 4.33, most of the respondents believed in recovering the water which diverted to the waste system and cleaning it to be reused in portable water consumption. Furthermore, adapting specific technologies and methods to supply the water in better service with less water usage had drawn 3.67 as the average index from the respondents.

Majority of the respondents agreed that GBI involves innovation elements in any green building project. This criterion received 5.00 as the average index. Furthermore, development of innovative ideas in the construction's element received 4.33 as the average index from the respondents.

## 5. Discussion

### 5.1 Energy Efficiency (EE)

It showed that the green building project would save the thirty-six percent of energy consumption rather than the conventional project. In addition, any of green building project would reduce the electrical productivity by using direct sunlight as the medium of energy consumption. The implementation of the system could reduce the electricity consumption and layout of the building also one of the achievement of EE. Thus, the implementation of EE in the Malaysian construction industry is beneficial to the contractors and give a constructive impression to the national economic growth in enhancing the future of green building project.

### 5.2 Indoor Air Quality (IAQ)

Indoor Air Quality would reduce the electrical lighting consumption by installing operable window in the buildings. This is not only to increase the level of comfort of the buildings' occupants; but also utilised the usage of the natural resources and increased the ventilation and lighting control for the buildings. Furthermore, building design can be improvised with the adaptation of the usage of low volatile organic compound material, utilisation of quality air filtration, proper control temperature, movement, and humidity of air and improved the achievement of IAQ in any of green building

projects. In reducing bio aerosol growth and improving the thermal performance, any of green building projects should improve its moisture management as supported by Persily [5]. This improvement can be accomplished through the envelope design and construction of the projects themselves.

### 5.3 Sustainable Site Planning and Management (SM)

A proper site planning should be considered in any of green building projects to sustain the positive environmental impact to the surrounding areas. Each project development should submit the structure plan for the proposed area, and it is compulsory to comply with the guideline given by the local authorities as per stated in Nizarudin, Mohd Hussain, and Tukiman [6]. Furthermore, any of green building projects should have a proper site management to reduce the construction materials and wastage on site. If any of the projects excels in dealing with this problem, it would benefit the contractors in achieving the project's goals [7].

### 5.4 Material and Resources (MR)

In the main process of MR's criterion, selection of materials that consists green features elements without affecting the quality of the project is crucial. Thus, the positive result could be seen in betterment on the environment, low maintenance of the building and low cost of the project as per stated in Rahardjati, Khamidi, and Idrus [8]. Besides that, the adaptation of 3R concept in enhancing the systematic construction waste management plays an important role in reducing the negative effect to the environment. There are sub-section in GBI checklist for the contractors to segregate the construction waste (e.g., plastic, concrete, timber, and glass), submit to the registered waste management company and acknowledge the consultant as proof of the implementation of the 3R concept as stated by Muksain [4].

### 5.5 Water Efficiency (WE)

The GBI guideline has set up the amount of water in sanitary fitting such the amount of water flow in water tap per second, hand bidet taps in the water closet, and water closet. In this WE's criterion, these processes can be visualised rather than the other criteria. Several of contractors agreed that there are different methods of constructing the rainwater harvesting system to enhance the water recycling processes at the construction site.

### 5.6 Innovation

The respondents stated that the innovation criterion was different between each of the green construction projects. The criterion indicated that the process of developing the creative ideas from designing stage as the trigger phrase in enhancing the adaptation of GBI. The requirements should emphasise on the objectives of the sustainable design to be more efficient in the future. Furthermore, the understanding of each of the required criteria in the checklist involved will provide a better understanding in achieving the objectives of the implementation of GBI assessments.

## 6. Conclusion

All the respondents, which directly involved in the green construction acknowledged the requirement of each criterion, the methods to fulfil the requirement and the impact of the GBI assessments towards the projects. The significance of each criterion had also been agreed by most of the respondents.

However, the authors believe that several improvements to the GBI assessment checklist should be made for the future green building projects as agreed by the contractors on the checklist. There is need to increase the awareness among the citizens and end-users through the education and media report. Furthermore, Lop, Che Ahmad, and Nik Zulkipli [9] stated that education and training should be included in any of green building development to be well known and acknowledged by the people. Improvement in MR's criterion, POE's criterion and the checklist should also considered the environmental interior design's system and materials. Aside, the government should increase the financial fund for the GBI project as well.

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