



CHALLENGES OF THE GREEN BUILDING  
CONSTRUCTION INDUSTRY IN MALAYSIA

BY

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the degree of Master of Science in Built Environment

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## **ABSTRACT**

Society has an obligation to the environment, which is deteriorating as a result of irresponsible human activity. In the realm of the built environment, that obligation manifests itself through green building construction. However, reluctance of professionals, especially contractors, in the green building construction industry to embrace green building practices and the high level of energy consumption in buildings are prevalent problems in Malaysia. This study has explored the inherent bureaucratic, technical, and social factors contributing to these problems. This was done through extensive literature review, case studies of green certified buildings in Malaysia, comparative study of GBI, Green Mark and LEED, structured interviews with the versatile professionals in the industry, and in-depth interviews with experienced industry professionals and policy makers. The theoretical framework was based on the major factors affecting green building construction, which are lack of education and awareness, lack of attractive incentives, reluctance to embrace change, insufficient finances, ineffective policies, and lack of resources. This study has identified the prevalent challenges impeding the advancement of green building construction through having investigated the technical and bureaucratic aspects of the green building construction industry, having examined the inherent social factors that impact the green building construction industry, and having identified the shortcomings of GBI. Through analysis of the qualitative field research findings and comparative analysis of GBI, Green Mark and LEED, this study has answered the research questions of what the disadvantages of the green building construction industry are, what actions and incentives it takes to motivate those in the industry to adopt green building construction, and what strategies GBI can apply from Green Mark and LEED, which are applicable in a Malaysian context. The study has discovered that the factors affecting the green building construction industry are as follow: perceived inefficiency of GBI, low level of knowledge and expertise, overlapping and lax bureaucracy, and a lack of attractive incentives. These findings are used to recommend countermeasures to these challenges for the purpose of optimizing the potential of the green building construction industry in Malaysia.

## خلاصة البحث

إن للمجتمع واجب تجاه البيئة التي هي في تدهور مستمر نتيجة للنشاط البشري اللامسؤول. تتجلى هذه المسؤولية في مجال البناء بتشييد المباني الخضراء، لكن يعتبر عزوف المهنيين، وخاصة المتعاقدين، من صناعة تشييد المباني الخضراء من خلال تبني ممارسات البناء الخضراء، والمستوى المرتفع لاستهلاك الطاقة في المباني مشاكل سائدة في ماليزيا. لقد استكشفت هذه الدراسة العوامل البيروقراطية، والتقنية، والاجتماعية المتأصلة والمساهمة في مثل هذه المشاكل. وقد تم ذلك من خلال الإجراءات الآتية: إستعراض واسع النطاق للدراسات السابقة ودارسات حالة للمباني الخضراء المعتمدة في ماليزيا، وإجراء دراسة مقارنة بين كل من "مؤشر المباني الخضراء GBI"، و"العلامة الخضراء Green Mark"، و"الريادة في الطاقة والتصميم البيئي LEED"، والقيام بمقابلات منظمة مع عدة محترفين في هذه الصناعة، ومقابلات أخرى معمقة مع متخصصين في هذا القطاع من ذوي الخبرة وصانعي السياسات. وقد استند الإطار النظري للدراسة إلى العوامل الرئيسية المؤثرة على تشييد المباني الخضراء؛ وهي: نقص التعليم والوعي، وعدم وجود حوافز جذابة، والتردد في قبول التغيير، وعدم كفاية الموارد المالية، والسياسات غير الفعالة، ونقص الموارد. لقد تمكنت هذه الدراسة من التعرف على التحديات السائدة المعرقة لتقدم تشييد البناء الأخضر، وذلك من خلال ما يلي: التحقق من العوامل التقنية والبيروقراطية، لصناعة تشييد المباني الخضراء، والتحقق من العوامل الاجتماعية المتجذرة المؤثرة على صناعة تشييد المباني الخضراء، والتعرف على أوجه القصور لـ GBI. وبفضل تحليل نتائج البحوث الميدانية النوعية، وإجراء تحليل مقارنة لكل من GBI، وGreen Mark، وLEED، فقد تمكنت هذه الدراسة من الإجابة على أسئلة البحث التي تدور حول التعرف على مساوئ صناعة تشييد المباني الخضراء، والحلول والمحفزات المطلوبة لدفع أصحاب هذه الصناعة لتبني تشييد المباني الخضراء، والتعرف على الإستراتيجيات المناسبة للبيئة الماليزية والتي يمكن لـ GBI أن تستفيد منها من كل من Green Mark وLEED. لقد اكتشفت الدراسة في الأخير أن العوامل المؤثرة على صناعة تشييد المباني الخضراء هي كالتالي: عدم الكفاءة المدركة لـ GBI، وانخفاض مستوى المعرفة والخبرة، وبيروقراطية التداخل والتراخي، ونقص الحوافز المغرية. وقد استعملت هذه النتائج لاقتراح توصيات في شكل سياسات تعمل على التصدي لتلك التحديات، وذلك من أجل تحقيق الإستفادة المثلى من إمكانيات صناعة تشييد المباني الخضراء في ماليزيا.

## APPROVAL PAGE

I certify that I have supervised and read this study and that in my opinion, it conforms to acceptable standards of scholarly presentation and it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science in Built Environment.

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Muhammad Abu Eusuf  
Supervisor

I certify that I have read this study and that in my opinion, it conforms to acceptable standards of scholarly presentation and it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science in Built Environment.

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Dean, Kulliyyah of Architecture  
and Environmental Design

## DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions

Mariam Aliou

Signature .....

Date.....

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*DEDICATED TO*

*My family*

*My friends*

*Fellow researchers who contribute to the advancement of sustainable  
development in the built environment; who strive towards positive change through  
academia and action.*

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## LIST OF ABBREVIATIONS

ACEM	Association of Consulting Engineers Malaysia
ASEAN	Association of Southeast Asian Nations
ASHRAE	American Society of Heating Refrigerating and Air-conditioning Engineers
APEC	Asia-Pacific Economic Corporation
BCA	Building Construction Authority
BEI	Building Energy Intensity
BREEAM	Building Research Establishment Environmental Assessment Methodology
CFC	Chlorofluorocarbon
CIDB	Construction Industry Development Board
CO <sub>2</sub>	Carbon Dioxide
dB	Decibel
EAP	Energy and Atmosphere
EPA	Environmental Protection Agency
GBI	Green Building Index
GHG	Greenhouse Gas
GnPR	Green Plot Ratio
HVAC	Heating Ventilation and Cooling
IBS	Industrialized Building Systems
IGEM	International Greentech & Eco-products Exhibition & Products Malaysia
IUM	International Islamic University Malaysia
KAED	Kulliyyah of Architecture and Environmental Design
KETTHA	Kementerian Tenaga, Teknologi Hijau dan Air
KLIA	Kuala Lumpur International Airport
kWh/m <sup>2</sup>	Kilowatt per hour per square meter
LEED	Leadership in Energy & Environmental Design
LCA	Life Cycle Assessment
MGBC	Malaysia Green Building Confederation
MRC	Malaysian Resource Corporation
MW	Megawatt
NEEMP	National Energy Efficiency Master Plan
NPP	National Physical Plan
NREB	Non-Residential Existing Buildings
NRNC	Non-Residential New Construction
ODP	Ozone Depleting Potential
PAM	Pertubuhan Akitek Malaysia
PCM	Phase Change Materials
PhD	Doctorate of Philosophy
QLASSIC	Quality Assessment System
REHDA	Real Estate Housing and Development Agency
SBS	Sick Building Syndrome
SIRIM	Standards and Industrial Research Institute

SPM	Sijil Pelajaran Malaysia
SREP	Small Renewable Energy Power Program
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
VOC	Volatile Organic Compounds
WHO	World Health Organization



# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1 INTRODUCTION**

In the realm of the built environment, innovative buildings approaches in response to the dire state of the natural environment have been adopted for over 20 years. With the advance of knowledge and technology, greater strides have been achieved through the inception of green buildings. Green buildings can be defined as “buildings that focus on increasing the efficiency of resource use – energy, water, and materials – while reducing building impact on human health and the environment during the building’s lifecycle, through better siting, design, construction, operation, maintenance, and removal. They should be designed and operated to reduce the overall impact of the built environment on its surroundings” (Green Building Index, 2013).

### **1.2 BACKGROUND OF STUDY**

According to the Malaysian Green Building Confederation, a council founded in 2007 for the purpose of promoting the planning, construction, maintenance and operation of green buildings, Malaysia is rapidly industrializing and most of the 5% to 9% annual growth in the construction industry is unsustainable (Malaysia Green Building Confederation, 2013). Therefore, green building construction is necessary in order to minimize the damaging effects of such rapid industrialization on both the natural environment and societal health and well-being. In Malaysia, there are numerous government agencies who strive to promote green building construction, such as Pertubuhan Akitek Malaysia (PAM), Energy Ministry, Malaysia Green Building Confederation, Ministry of Housing, Construction Industry Development Board

(CIDB), The Malaysian Resource Corporation, and the Real Estate Housing Development Agency (REHDA). Such agencies have launched green rating tools and initiatives which strive to promote awareness and adoption of green building construction practices, as well as educating the general public about the importance of environmental protection through responsible practices.

Despite these efforts, there are still many challenges in implementing green building construction from both consumers and developers. From a consumer and general public standpoint, the awareness level of green building construction and overall environmental conservation issues are major factors affecting their behavior, along with other social factors which will be investigated in this study. From a developer standpoint, there is dissatisfaction with the governance and with the local green rating tool, Green Building Index (GBI), for which there are alternatives, both local and international. These alternative green rating tools which are commonly used to certify green buildings in Malaysia, either independently or concurrently with GBI are Green Mark and LEED, which will be further explored in the Literature Review Chapter.

### **1.3 PROBLEM STATEMENT**

Electricity in buildings in Malaysia accounts for 90% percent of the energy consumption, which is among the highest in South East Asia (Zainul, 2005), and therefore green buildings are essential in lowering such high energy consumption. Another prevalent problem is the reluctance to invest in green building construction; the notion that short term spending yields significant long-term benefits is one which is not readily accepted by investors (Abidin, 2010). However, the use of advanced technologies used in green buildings, which are becoming more prevalent, must be

analyzed to determine which tools are appropriate and fitting to average Malaysian financial and social conditions (Azman, 2010).

A problem concerning existing green buildings is that initially they meet the criteria for certification but during their life cycles, the energy consumption continually increases and the building does not meet the design intent for which it was initially certified. This can result from projects being designed for the initial aim of passing the qualifications for them to be green buildings solely for marketing purposes, to attract investors (Yates, 2001). Another reason is even though some buildings are meticulously designed and precautions are taken from inception to construction, operation costs and energy consumption sky-rocket during their life cycles and the building performance declines (Esmailifar, 2013). This study will give further insights into the factors that contribute to buildings' performance declining post-certification.

### **1.3.1 Recent Problem**

A perpetual problem is the failure of those in the industry, more specifically contractors, to implement green building construction. Despite efforts in striving to educate and monitor contractors, there is still a reluctance to adopt responsible green building construction practices (Abidin, 2010). This reluctance is partly attributed to dissatisfaction with GBI, for which there are alternatives such as Green Mark and LEED, which will be comparatively analyzed in this study.

A shared frustration among industry professionals is the low level of compliance of green building construction standards and practices among contractors, and an inadequate level of regulation and enforcement towards contractors (Harn,

2011). The underlying factors contributing to these problems will be identified in this study.

This study aims to identify the challenges that are impeding the advancement of green building construction in Malaysia, for the purpose of providing countermeasures to optimize its potential.

#### **1.4 RESEARCH QUESTIONS**

In order to provide countermeasures to the challenges of the green building construction industry, this study must first address the following questions:

1. What are the disadvantages of the green building construction industry in Malaysia?
2. What actions and incentives does it take to motivate those in the industry to adopt green building construction?
3. What strategies can GBI apply from Green Mark and LEED, which are applicable in a Malaysian context?

#### **1.5 RESEARCH OBJECTIVES**

The research aim, as stipulated above, will be carried out through the following objectives:

1. To investigate the technical and bureaucratic aspects of the green building construction industry, such as technologies, policies, and initiatives, and identify their shortcomings.
2. To examine the inherent social factors that impact the green building construction industry.

3. To identify the shortcomings of GBI and propose how it can be optimized, through a comparative analysis of GBI, Green Mark and LEED.

## **1.6 RESEARCH METHODOLOGY**

### **1.6.1 Literature Review**

The green building construction industry in Malaysia, Green Mark, and LEED are understood primarily through literature. Singapore is climatically similar to Malaysia and GBI was designed for the tropics, as was Green Mark (GBI, 2013). Green Mark, which predates GBI, is often adopted in certifying Malaysian buildings. In fact, the first green certified building in Malaysia, GTower Hotel, was Green Mark gold certified in 2010 (Chan, 2011) and in some cases, both GBI and Green Mark are used concurrently to offset each other (Harn, 2013). LEED is internationally renowned, as well as widely accepted and applied to Malaysian buildings. This comparative portion of the literature review contributes to fulfilling the research objective of identifying the shortcomings of GBI and proposing how it can be optimized.

All the abovementioned information is attained through desk research; through IIUM library and KAED Resource Centre, journal articles pertaining to green building construction, pamphlets, magazines, conference papers, internet resources, and environmental and green building agencies.

### **1.6.2 Case Studies**

Two GBI certified buildings are selected as case studies, the Green Energy Office and Digi Technology Operation Centre. The Green Energy Office building is officially Malaysia's first GBI certified building and an icon for energy efficiency, not only in the Malaysia, but in South East Asia (GBI, 2013). It is used as a case study to examine

its innovative energy efficient features, which contributes to fulfilling the research objective of investigating the technical aspects of green building construction, such as the technologies.

The Digi Technology Operation Centre is used as a case study to examine its responsible behavioral approaches towards energy conservation. This contributes to fulfilling the research objective of examining the inherent social factors that impact the green building construction industry.

### **1.6.3 Field Research: Structured Interviews and In- Depth Interviews.**

The structured Interviews are an anonymous structured interview is prepared and distributed among professionals in the green building and construction industry for the purpose of fulfilling the research objective of examining the inherent social factors that impact the green building construction industry.

In-depth interviews are conducted with three professionals in the green building construction industry, whose experiences and input offer an inside look into the industry. A fourth in-depth interview is also conducted with an authority, PAM president, for the purpose of validating, confirming, or negating the collective field data acquired. The findings from the in-depth interviews contribute to fulfilling the research objective of investigating the bureaucratic aspects of the green building construction industry, such as policies and initiatives, and identifying their shortcomings.

## **1.7 SCOPE OF STUDY**

This study covers the background and principles of green building construction, and takes an in-depth look into the Malaysian green building construction industry.

Through literature review, it gathers data pertaining to the technical, bureaucratic, and social challenges prevalent in the industry, which is then verified by field research. Through analysis of the collective theoretical literature data and empirical field research findings, this study makes recommendations for optimizing the green building construction industry in Malaysia.

## **1.8 STRUCTURE OF STUDY**

- **Chapter 1: Introduction**

This chapter gives a brief background of the status quo of the green building construction industry in Malaysia, and sets out the aim and objectives of the study, problem statement and research questions. It gives an overview of what to expect throughout the study.

- **Chapter 2: Literature Review**

This chapter comprehensively discusses the principles of green building construction, government initiatives towards energy conservation and promotion of green building construction, and compares the different green rating tools used in the Malaysian green building construction industry. Ultimately, it identifies the factors that affect the green building construction industry.

- **Chapter 3: Research Methodology**

This chapter discusses the various methods used to conduct this study, such as types of data collected, sampling methods, and data analysis methods.

- **Chapter 4: Data Analysis and Findings**

In this chapter, the collective data gathered from field research is quantified, discussed and analyzed and compared with the literature review findings.

- **Chapter 5: Summary, Recommendations and Conclusions**

This chapter summarizes the research findings post-analysis and provides recommendations for overcoming the challenges identified throughout the research. It also provides recommendations for future research