

**INTEGRATING GREEN INITIATIVES INTO EXISTING
COMMERICAL BUILDINGS**

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Dedicated to my beloved wife, Ms. Jesslyn Quek for her everlasting support and encouragement throughout my studies

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ABSTRACT

The sustainable building movement is suffering a crisis of overhype and from focusing too often on new buildings. The refurbishment of existing buildings is a crucial yet often being neglected. Many old buildings waste large amounts of energy and provide poor internal conditions for occupants through poor lighting, poor ventilation, solar penetration and glare, and poor control of heating and cooling. Making existing buildings more sustainable will be the next big focus for the design industry. The aim of this research is to study the green concept applying to existing buildings; to establish the most critical of these aspects; and to identify methods to improve the existing buildings. The methodology for conducting the study involved literature review, data collection and analysis of results using the Average Index Method. The process of data collection involved obtaining primary data from the respondents by conducting questionnaires surveys and interview with building professional. The primary barriers and benefits towards green initiatives in existing building have been identified.

ABSTRAK

Pergerakan bangunan tahan lama mengalami krisis penambahan bangunan dan terlalu memfokus kepada bangunan baru. Pembaikpulihan bangunan sediaada adalah penting tetapi selalunya diabaikan. Kebanyakan bangunan lama mangalami pembaziran tenaga dan tidak memberi kebaikan kepada penghuni bangunan kerana kelemahan pada sistem cahaya lampu, pengudaraan, tiada penggunaan cahaya semulajadi dan amalan sistem hawa pendingin yang tidak berkesan. Fokus utama industri pembinaan selepas ini adalah untuk menjadikan bangunan sediaada lebih berdaya saing dan bertahan lebih lama. Tujuan penyelidikan ini adalah untuk mengkaji konsep kehijaunan kepada bangunan sediaada; mengenalpasti aspek-aspek yang paling kritikal; dan mengenalpasti kaedah-kaedah untuk menaikkan taraf bangunan yang sedia-ada. Methodologi bagi melaksanakan kajian ini merangkumi rujukan bahan literature, pengumpulan data dan analisis data melalui Kaedah Indeks Purata. Proses pengumpulan data merangkumi pengumpulan data primer daripada responden dengan menjalankan soal selidik dan temuduga dengan profesional. Primer halangan dan kejayaan untuk konsep kehijaunan bagi bangunan yang sedia-ada telah di ketahui.

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LIST OF SYMBOLS

%	-	Percentage
°C	-	Celcius
CO	-	Carbon dioxide
Kwh/m ²	-	Kilo watt hour per meter square
m/s	-	Meter per second
M	-	Meter
MM	-	Millimeter
M ²	-	Meter square
M ³	-	Meter cube
MWh/year	-	Mega watt hour per year
O ₂	-	Oxygen
Pa	-	Pascal
ppm	-	Part per million
RM	-	Ringgit Malaysia
m/s	-	Meter per second

LIST OF ABBREVIATIONS

AC	-	Alternative Current
ACH	-	Air Change Rate
AHU	-	Air Handling Unit
ASHRAE	-	American Society of Heating, Refrigerating and Air conditioning Engineers
BAS	-	Building Automation System
BCS	-	Building Controlled System
BEMS	-	Building Energy Management System
CIBSE	-	Chartered Institution of Building Services Engineers
DC	-	Direct Current
DX	-	Direct Expansion
EPU	-	Economic Planning Unit
EE	-	Energy Efficiency
GFA	-	Gross Floor Area
HVAC	-	Heating, Ventilating and Air conditioning system
IAQ	-	Indoor Air Quality
IBS	-	Intelligent Building System
KLCC	-	Kuala Lumpur City Centre
KLIA	-	Kuala Lumpur International Airport
LEO	-	Low Energy Office
LUX	-	Lumen

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Greenhouse gasses and ozone depletion became household words following the Earth Summit in Rio, 1992. Since then Green building ratings began to be developed in the 1990s with BREEAM (UK, 1990) and later LEED (USA, 1996) being the better known ones.

This was the result of the realization that buildings and the built environment contributes significantly to green house gas emissions and thus they needed to be re-designed to reduce their negative impact to the environment.

The notion of buildings being “machines for living” is proven true as buildings do last a long time and over that lifetime they do play a part in adding to the destruction of the environment (Charles J. Kibert). Green rating tools were conceived to be able to assist architects, designers, builders, government bodies, building owners, developers and end users to understand the impact of each design choice and solution. By so doing, the final

built product would perform better in its location whilst also reducing its harmful impact on the surroundings.

Green rating tools by its nature and role is very dependent upon location and environment and thus climate. A quick survey of existing Green Rating tools available in the world today will show all of them concentrated within the temperate climate zones. Some better known ones include UK's BREEAM, USA's LEED, Japan's CASBEE and Australia's GREENSTAR.

Malaysia's Green Building Index or GBI will be the only rating tool for the tropical zones other than Singapore Government's GREENMARK. GREENMARK was first launched in 2005. In April 2008, it became mandatory for all new buildings or works on existing buildings exceeding 2,000sq.m in floor area to achieve a minimum GREENMARK Certified rating in Singapore. Whilst GREENMARK's operational parameters are within the tropical climate, its scoring priorities are very much customized for the current state of Singapore where a lot of priority is given to energy and water efficiency scores. In addition its public transport network is also already in place and thus little priority is given to this in the ratings. Malaysia differs markedly in these areas and thus understandably our rating priorities should be like-wise customized to suit – both to our climate and also the current state of our country's development and existing resources.

Green Building Index is developed by Pertubuhan Akitek Malaysia (PAM) and the Association of Consulting Engineers Malaysia (ACEM). It is a profession driven initiative to lead the Malaysian property industry towards becoming more environment-friendly. From its inception GBI has received the full support of Malaysia's building and property players.

It is intended to promote sustainability in the built environment and raise awareness among Developers, Architects, Engineers, Planners, Designers, Contractors and the Public about environmental issues. The rating system will provide opportunity for developers to design and construct green, sustainable buildings that can provide energy

savings, water savings, a healthier indoor environment, better connectivity to public transport and the adoption of recycling and greenery for their projects.

1.2 Research Problem

Energy consumption remains the single most important green building issue, not only because of its environment impacts but also because of the probability of significantly higher future energy cost. Due to the high energy consume by most of the commercial buildings throughout the year impact from electrical power generation includes global climate change, acid rain, ground level ozone creation, and a wide range of health effects caused by the emission of particulates. In the future, this situation will only worsen because billion square feet of new buildings are forecasted to be built between 2009 and 2010 (Kannan, K. 2001).

The sustainable building movement is suffering a crisis of overhype and from focusing too often on new buildings. We have seen a groundswell of ideas, legislation, and examples of new green buildings in recent years, but comparatively little work has been done on how to make existing buildings more sustainable. The refurbishment of existing buildings is a crucial yet often being neglected. Many old buildings waste large amounts of energy and provide poor internal conditions for occupants through poor lighting, poor ventilation, solar penetration and glare, and poor control of heating and cooling (Charles J. Kibert). Making existing buildings more sustainable will be the next big focus for the design industry.

Demolition is an option but the refurbishment alternative is increasingly seen as more sustainable in terms of architectural value, materials use, neighbourhood disruption and waste disposal. In addition, the potential impact of low energy refurbishment is much greater than that for new build since there are many more buildings already in existence.

Energy is the largest operational expense for most facilities, contributing to at least 30% of a typical office building's expenses. The local Green Building Index estimates that

commercial office buildings use 20% more energy on average than necessary (Azni Zain-Ahmad). Therefore it is evident that these facilities are wasting natural resources, which is both detrimental to the environment and also an increased cost to corporations. As a result many organizations are beginning to undertake sustainable measures in order to decrease these energy costs. This recent increased support for sustainability has caused the green building industry to expand rapidly.

Although there is no single standard for measuring sustainability in the Malaysia, the local GBI green building rating system, developed by PAM (Pertubuhan Akitek Malaysia), is becoming the de facto standard. The current Malaysian office buildings used high electricity consumption at 250 KWhr/m² per year as according to GBI BEI (Building Energy Index). The benchmark of BEI for energy efficient building would be less than 150 KWhr/m² per year (PAM). In order to achieve this value, certain criteria are needed to improve existing non-sustainable buildings.

1.3 Aim of the Research

The aim of this study is to review the green initiatives towards existing commercial buildings in Malaysia and its potential improvements.

1.4 Objectives of the Research

To achieve the above aim, the following objectives have been identified

- i) To identify the awareness of building professional towards green initiatives in Malaysia.
- ii) To identify the barriers and benefits by incorporating green initiatives into existing commercial buildings.

- iii) To propose potential improvements by incorporating green initiatives into existing commercial buildings.

1.5 Scope of Study

A rating system called Green Building Index (GBI) will be utilised as a basis for this research. The research conduct for this thesis is looking at existing commercial office buildings that without any green initiative elements and identify the criteria used in making them green. In other words, it is purely focus on existing non-sustainable commercial office buildings. Apart from that the study is also limited to building professional only such as Architect's, Engineer's, Contractor's, Supplier's and QS.

This is to enhance the poor design practices for old buildings to come up or retrofit with sustainable design which is so call green building design that incorporate energy saving factors.

1.6 Brief Research Methodology

The first step of the study was identifying research problem which covered the significance, objective and scope of study followed by exploratory research of the literature. Information was gathered through two sources. Firstly through journals, books and reports and secondly through finding existing data from selected buildings.

Questionnaire for awareness was developed using the information obtained from potential respondents and were handed over to respondents by hand, facsimile, email and by mail. After three weeks, the researcher received back the questionnaires either through post or collected by hand whereby hand-collection gave the researcher the opportunity to conduct interview sessions with the respondents.

1.7 Expected Findings

In this study, there are four (4) main objectives which lead into the understanding of incorporating 'Green Rating' system into existing buildings.

The first expected findings will show the levels of awareness of green building among Malaysian citizen. This finding is important as guidance and served as a reference to give future engineers, architects etc. to improve public awareness on green building.

The second findings will show the demand of the needs of green building in Malaysia. This will gives an insight of the popularity and needs of green building by local developers in the markets.

The third finding gives an understanding of the problems and limitation facing by existing building owners in adopting green building certification. Through this findings, more outcomes can be generated from existing building owners with their thoughts and needs which will helps to improve on the green building rating systems.

By incorporating the green rating system into the existing buildings, it will show great improvements on the building performance. These includes saving buildings operational costs, better indoor air quality, etc.