THE BARRIERS AND STRATEGIES TO SUCCESSFUL IMPLEMENTATION OF
SUSTAINABLE CONSTRUCTION
IN RESIDENTIAL BUILDINGS

JASWEEN AMIERA BINTI ZAINUDDIN

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fulfilment of the requirement for the award of the
Bachelor of Technology Management (Construction) with honors

Faculty of Technology Management & Business
Universiti Tun Hussein Onn Malaysia (UTHM)

JANUARI 2018
DECLARATION

I hereby declare that the work in this project is my own except quotation summaries which have been duly acknowledged

Student : ......................................................
          JASWEEN AMIERA BINTI ZAINUDDIN
Date : ......................................................

Supervisor : ..................................................
            PM.DR. GOH KAI CHEN
Date : ......................................................
ACKNOWLEDGEMENT

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I take this opportunity to express my gratitude to my supervisor, Professor Madya Dr. Goh Kai Chen for sharing his expertise, valuable guidance and encouragement given to me. Also, his assistance and dedicated involvement throughout every process in completing this thesis. Thank you so much for your support and encouragement over these one year.

Most importantly, none of this could have happened without the support from my family. I would like to thank my parents, whose love and support me in whatever I pursue. As a family, they understand and encourage me endlessly.
ABSTRACT

The implementation of sustainable construction has been one of the main challenges in Malaysian construction industry. The implementation of sustainable construction have been unsuccessful due to various barriers such like lack of awareness among developers, lack of understanding of the sustainability concept and limited knowledge. This study identifies the main barriers to successful implementation of sustainable construction in the Malaysia residential area. A semi structured interviews was carried out among selected developers in Selangor state to identify the barriers for developers to successful implementation of sustainable construction and measures the strategies to overcome the barriers to sustainable construction. The survey has revealed the barriers to successful implementation of sustainable construction are higher cost of sustainable construction application, lack of awareness, material shortage, lack of technology, lack of knowledge and education and lack of client’s interest and requirements. Majority urged that the barriers to implement a sustainable construction is due to the low level of public awareness and mainly cause by financial constraints. This has greatly impact to successful implementation of sustainable construction. By adopting sustainable construction, it can minimize the overall energy used, minimize waste, decrease the rate of pollutions, conserve the natural resources, enhance water quality and maximize potential for renewable energy supply.

Keywords: Barriers, Construction Industry, sustainable construction
# CONTENT

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECLARATION</td>
<td>ii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENT</td>
<td>iii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>iv</td>
</tr>
<tr>
<td>CONTENT</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>x</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xii</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td></td>
</tr>
</tbody>
</table>

## CHAPTER 1 INTRODUCTION

1.1 Introduction 1
1.2 Problem Statement 2
1.3 Background of Research 3
1.4 Research Questions 4
1.5 Research Objectives 5
1.6 Scope of Research 5
1.7 Methodology 5
1.7.1 Stage I 6
1.7.2 Stage II 6
1.7.3 Stage III 6
1.8 Expected Result 6

## CHAPTER 2 LITERATURE REVIEW

2.1 Sustainable construction definition 7
2.2 Sustainable construction 8
2.3 Sustainability concept 9
2.3.1 Environmental sustainability 9
2.3.2 Economic sustainability 9
2.3.3 Social sustainability 10
2.4 Sustainability and the construction industry 10
  2.4.1 Malaysian Construction Efforts On Sustainable Construction 11
2.5 Benefits of sustainable construction 12
2.6 Principles issues on sustainable construction 14
2.7 Sustainable development definition 14
  2.7.1 Sustainable development 16
2.8 Sustainable development strategies 16
2.9 Barriers in implementing sustainable construction 17
  2.9.1 Lack of professionals 17
  2.9.2 Lack of training and education 17
  2.9.3 Higher cost of sustainable building option 18
  2.9.4 Lack of well-defined sustainable construction Practices 18
  2.9.5 Lack of material, method and technologies 18
2.10 Implementation of sustainable construction practices in construction projects 19
2.11 Malaysia’s incentives in implementing sustainability in construction projects 19
  2.11.1 Green Building Index (GBI) 20
  2.11.2 Malaysian Carbon Reduction and Environment Sustainability Tool (myCREST) 20
  2.11.3 Sustainable Construction Excellence Centre 21
2.12 Strategies Towards Sustainability In Construction Industry 21
  2.12.1 Government’s Role in Promoting Sustainability 21
  2.12.2 Education Sector To Raise Level of Awareness 22
  2.12.3 Actions By The Private Sector 22
  2.12.4 In-service Training On Sustainability 22
### CHAPTER 3 METHODOLOGY

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Introduction</td>
<td>24</td>
</tr>
<tr>
<td>3.2</td>
<td>Research Design</td>
<td>25</td>
</tr>
<tr>
<td>3.3</td>
<td>Sources of Data</td>
<td>25</td>
</tr>
<tr>
<td>3.3.1</td>
<td>Primary Data</td>
<td>26</td>
</tr>
<tr>
<td>3.3.2</td>
<td>Secondary Data</td>
<td>26</td>
</tr>
<tr>
<td>3.4</td>
<td>Research Method</td>
<td>27</td>
</tr>
<tr>
<td>3.4.1</td>
<td>Qualitative</td>
<td>27</td>
</tr>
<tr>
<td>3.5</td>
<td>Data Collection Techniques</td>
<td>28</td>
</tr>
<tr>
<td>3.5.1</td>
<td>Interviews</td>
<td>28</td>
</tr>
<tr>
<td>3.5.2</td>
<td>Recording Data</td>
<td>29</td>
</tr>
<tr>
<td>3.6</td>
<td>Population and Sampling</td>
<td>29</td>
</tr>
<tr>
<td>3.6.1</td>
<td>Sampling</td>
<td>29</td>
</tr>
<tr>
<td>3.7</td>
<td>Research Methodology</td>
<td>30</td>
</tr>
<tr>
<td>3.7.1</td>
<td>Data Analysis</td>
<td>30</td>
</tr>
<tr>
<td>3.7.2</td>
<td>Data Presentation</td>
<td>31</td>
</tr>
</tbody>
</table>

### CHAPTER 4

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Introduction</td>
<td>32</td>
</tr>
<tr>
<td>4.2</td>
<td>Data Collection</td>
<td>33</td>
</tr>
<tr>
<td>4.3</td>
<td>Respondents Background</td>
<td>33</td>
</tr>
<tr>
<td>4.4</td>
<td>The Understanding of sustainable construction</td>
<td>35</td>
</tr>
<tr>
<td>4.5</td>
<td>Duration of sustainable practices by the company</td>
<td>37</td>
</tr>
<tr>
<td>4.6</td>
<td>Importance of implementing sustainable construction</td>
<td>38</td>
</tr>
<tr>
<td>4.7</td>
<td>Application of sustainable construction within company</td>
<td>39</td>
</tr>
<tr>
<td>4.8</td>
<td>Implementation of sustainable construction is still at early stage</td>
<td>41</td>
</tr>
<tr>
<td>4.9</td>
<td>Reasons on unsuccessful and ineffective implementation of sustainable construction among developers in Malaysia</td>
<td>42</td>
</tr>
<tr>
<td>4.10</td>
<td>Professional knowledge and expert are essential in delivering sustainable construction</td>
<td>43</td>
</tr>
<tr>
<td>4.11</td>
<td>The most difficult things the company faced</td>
<td></td>
</tr>
</tbody>
</table>
in delivering sustainable construction 44

4.12 Barriers in implementing sustainable construction 45

4.13 Higher Cost of Sustainable Construction Application 46

4.13.1 Cost of Sustainable Material 47

4.13.2 Financial 47

4.13.3 Construction Method/Application 48

4.13.4 Professional Service 48

4.14 Lack of Awareness 49

4.15 Material Shortage 50

4.16 Lack of Green Technology 50

4.17 Lack of Client’s Interest and Requirements 51

4.18 Ways To Manage The Difficulty When
Implementing Successful Sustainable Construction 52

4.19 Approach In Achieving Sustainable Construction
By Increasing The Awareness Level 54

4.20 Ways To Improve Knowledge And Skills On
Sustainable Construction Concept 55
5.1 Introduction 56
5.2 Conclusion 57
5.3 Objective 1: Identifying the barriers for successful implementation of sustainable construction in Malaysia residential area 57
5.4 Objective 2: To discover the strategies towards successful implementation of sustainable construction 58
5.5 Limitation of research 58
5.6 Further Findings 59
5.7 Recommendations 59
LIST OF TABLES

2.1 Principles of sustainable construction
4.1 The understanding of sustainable construction among developers
4.2 Statements by the respondents regarding sustainable construction based from their understanding
4.3 The importance of implementing sustainable construction
4.4 The application of sustainable construction implement by developers
4.5 GBI Classification
4.6 Developer’s approval based from the given statements
4.7 Statements by the developers on ineffective implementation of sustainable construction
4.8 A survey on the essential of professional’s knowledge and expertise in sustainable construction
4.9 Six themes of main barriers in successful implementation sustainable construction
4.10 Developers way to overcome the potential barriers
4.11 GreenRE classification
4.12 Approach in delivering sustainable construction by increasing public awareness
4.14 Ways to improve knowledge and skills on sustainable construction
LIST OF FIGURES

2.1 Model Jacobs and Sandler (Boothroyd, 1990) 15
4.1 Working experience as developers 33
4.2 Gender of the respondent 34
4.3 Duration of sustainable construction practices 37
4.4 The most difficult thing faced in delivering sustainable construction 44
4.5 Factors of higher cost in implementing sustainable construction 46
4.6 Contribution factors to lack of demand 51
## LIST OF SYMBOLS AND ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACEM</td>
<td>Association of Consulting Engineers Malaysia</td>
</tr>
<tr>
<td>CIDB</td>
<td>Construction Industry Development Board</td>
</tr>
<tr>
<td>CIB</td>
<td>Conseil International du Batiment</td>
</tr>
<tr>
<td>GASSIC</td>
<td>Green Assessment System in Construction</td>
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<tr>
<td>GBI</td>
<td>Green Building Index</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>LAM</td>
<td>Lembaga Arkitek Malaysia</td>
</tr>
<tr>
<td>MyCREST</td>
<td>Malaysian Carbon Reduction and Environment Sustainability Tool</td>
</tr>
<tr>
<td>PAM</td>
<td>Pertubuhan Arkitek Malaysia</td>
</tr>
</tbody>
</table>
CHAPTER 1

INTRODUCTION

Malaysia is one of the developing countries and forging ahead to reach the status of develop country in 2020. Construction industry is one of the industries that contribute to socio-economic growth and plays a major role in achieving the vision. However, the construction development has been linked to environmental degradation, economic and social issues which eventually affecting the quality of life and the future generation. According to CIDB (2007) this industry has negative impacts upon environment such as deforestation, noise and air pollution, soil erosion, flash floods, destructive of vegetation and depletion of natural resources. Therefore, the concept of “sustainable development” is introduced in Brundtland Commission Report, 1987. Furthermore, sustainable construction is an idea of ensuring a better quality life for now and for the future by achieving economy, social and environmental objectives at the same time. Hence, sustainable construction has emerged as guiding paradigm to create a new kind of built environment taking into account environmental, socio-economy and cultural issues (Ametepey et al., 2015).

Sustainable development is development that satisfy the needs of the present but not to undermine the future generations to meet their need. To accomplish this, it requires involvement of the people, level of knowledge and the understanding of the concept. Thus the developers can contribute a positive manner towards environmental protection through sustainable construction. Sustainable development would give opportunity of development to new future in a way that resources is being preserved and sustainable construction practices is the application of sustainable development (Sinha et al., 2012). Sustainable construction covers a wide areas which are energy efficiency, respect for the workforce, health and safety, diversity
in the workforce and building regulations (Ametepey, 2015). Therefore, living in the globalized world today will somehow have increased the demand of needs that have to be satisfied.

However, the increasing demand can cause detrimental effects on our mother earth as construction industry have long been associated with the environmental degradation. Through sustainable construction concept, the developers in Malaysia can ensure the better future life of the next generations onwards.

1.2 Problem Statement

Malaysia is successfully growing as developing country but construction industry is one of the largest contributor to carbon dioxide (CO2) emissions, a major consumer of non-renewable resources and a massive producer of waste. The environmental issues are due to lack of environmental considerations in exploitation, development and management of resources as well as lack of control pollution resources (Kamar, 2011). Nonetheless, buildings are consuming huge amount of energy and natural resources which affect the quality of air and water in the cities (Vyas, et al., 2014).

Sustainable construction is seen as a way to move towards sustainable development in Malaysia. However, many developers choose to not implement the sustainability concept as they have limited understanding and concern about sustainable construction concept. According to Zainul (2009), 42% of the developers are lack of understanding of the sustainability concept, 20% of developers have very poor level of understanding and the other 38% have a good understanding regarding the concept. This shows most developers have limited knowledge on the concept of sustainable construction which lead to development without concerning about environmental. Heading towards 2020, Construction Industry Development Board Malaysia (2016) aimed to achieve sustainability development and targeting to become Malaysia’s environmentally-sustainable construction that will be a model for Asian countries and the developers still at a crucial level on understanding the sustainability concept.
Environmental degradation issues in Malaysia has become more serious and frequent in the last half decade not only in Malaysia but for the whole Southeast Asia Region. Environmental degradation are caused by unsustainable patterns of developments that makes the main issue in Malaysia include the environmental degradation issues (Mokthsim, 2014). This have make the natural hazards worsen which is higher in the countries that environmental degradation is severe. The effects of natural hazards are deforestation, soil erosion, overgrazing, land degradation and desertification.

The sustainable construction practices is not being implement in the projects as the understanding of the concept is low. The developers are unaware about the consequences in development that continually will cause harm to the earth. The average of temperature in Malaysia will rose between two and five degrees in 2017 (Toh, 2016). Due to lack-sustainability-rated construction, the buildings and infrastructure are not always resilient to natural calamities as construction industry has always link to the environmental degradation.

Sustainable construction is not being implement in majority construction project in Malaysia. The implementation of sustainable practices is low to moderate level where 43% of developers are implementing the sustainability at low level, 20% of the developers who implementing the sustainability practices, another 34% at average level in implementing the practices and only 3% developers that do not implement the sustainability practices in their project (Zainul, 2009). This proved that only minority group of developers implement the sustainability practices in their project. The limited understanding and level of knowledge have led to little efforts in implementing the concept.

1.3 Research Background

Sustainable construction is the subset of sustainable development which is describes as a process in achieving suitability over time by demanding less non-renewable natural resources, efficient use of energy and waste minimizations (Abidin, 2009). Sustainable construction is the application of the principles of sustainable development to the construction sector which can be described in terms that complement the core philosophy such as construction, maintenance, ecological design, life-cycle assessment, green buildings and operations of infrastructure.
Sustainable development was first introduced in Brundtland Commission Report and many events has taken place to raise the awareness on sustainability and environmental (Abidin, 2008). Malaysia has not left behind in moving forward to increase the quality of life by implementing the Agenda 21 through its own development planning and long-term Outline Perspective Plan (Nordin and Hezri, 2006). Agenda 21 is committed to improve the quality of living, promote sustainable consumption and production, and protect the environmental, sustainable management of natural resources on enhancing human, institutional and infrastructure capacity (Hirono, 2003). This indicates the significant of understanding the concept of sustainable development.

The concept of sustainability start to being appreciated and gain worldwide attention once the advantages of sustainability have been acknowledge. In Malaysia, the Construction Industry Development Board’s (CIDB) has established a new operating model called Sustainable Construction Excellence Centre which will guide sustainable construction in Malaysia as a government effort towards achieving sustainability development by 2020. Sustainable Construction Excellence Centre is a short term goal that aimed at positioning Malaysia as a regional leader for sustainability in construction by 2017 (Inn, 2016). This shows that the concept of sustainability is taken seriously by the government and the environmental can be preserved, natural resources can be saved, increase the local business growth and making the community less vulnerable to the pollution threats if the concept of sustainable development strategies is being implement seriously.

In order to achieve sustainability development, sustainable construction is seen as a way to contribute towards it. The concept of sustainable construction governs by three main pillars, environmental protection, social well-being and economic prosperity. Environmental protection concerns to built environment which refer to the construction project itself that may impact the environment if it is not been handled effectively. Social well-being is focusing on the human satisfaction and enhance the quality of life (Suliman & Omran, 2009). Lastly, economic sustainability is concern about the monetary gains of the project and the benefits to the public and government from the project.
1.4 Research Questions

i. What are the barriers for Malaysian developers to implement the sustainable construction concept in their practices?

ii. What are the strategies that can move towards sustainable construction in Malaysia?

1.5 Objectives

1) To identify the barriers for Malaysia developers to implement the sustainable construction concept in their practices.

2) To investigate the strategies towards successful implementation of sustainable construction in Malaysia.

1.6 Scope of Research

This research focuses on finding the major barriers to successful implementation of sustainable construction within Selangor state. Participants were drawn from identified developers in building project. Selangor is the study area for this research. By lowering the major barriers, it will encourage the implementation of sustainable construction more successfully. The respondents helped to identify the barriers in implementing sustainable construction in building projects. Hence, the strategies towards successful implementation of sustainable construction are suggested.

1.7 Methodology

The aim of this study is mainly to investigate the current practices in construction project either the project implements the concept of sustainable development in construction and to explore the understanding of the concept of sustainable construction by Malaysia developers. A multi methods approach was adopted for the data collection to reach the objectives of this research.
1.7.1 Stage I

The first step involves a preliminary study of this research where all the information is gathered from various sources like academics journal, related articles, newspaper, web based search and books related to the research. This method is required to give an early idea of this research that will help to discover the amount of the information that is available for the topic related to research.

1.7.2 Stage II

The research is qualitative in nature. This research study conducts a series of interviews with the developers within the Selangor area. This method of data collection can be obtained by direct interactions, face to face interviews on individuals or in a group setting. This qualitative method will enable the researchers to develop a level of details into the actual experiences.

1.7.3 Stage III

In this study, the data analyzed qualitatively as the information obtained from the interviews sessions was in the form of opinions, statements and comments. The data collected from the interviews with developers was analyzed using content analysis.

1.8 Expected Results
The barriers of sustainable construction practices can be identified. Thus, variety of ways to implement the sustainable construction can be achieved as the barriers are overcome.

The current practices of construction project can be explore so strategies towards sustainable construction can be proposed.

CHAPTER 2

LITERATURE REVIEW

2.1 Sustainable Construction Definition

The adaptation of sustainable construction can reduce the overall energy use and maximize the potential for renewable energy supply. Sustainable construction practices can also lead to minimizing the waste, minimize the pollutions such water, soil, air and noise and enhance the water quality (Hussin, 2013). The definition of sustainable construction itself has various interpretations. For example, sustainable construction is defined as a way for the building industry to heading towards sustainable development, taking into account environmental, social and economic (United Nations, 2006). In addition, it involves issues such as the buildings materials, energy efficiency, management and design.

Furthermore, sustainable construction is considered as an investment in future as it is to improve the quality of the life for current and future generations (Suliman, 2009). Sustainable construction also involves a building life cycle from planning the construction, constructing, consumption of raw material to production, construction material usage, destruction of construction and waste management. Sustainable construction is the application
of sustainable development to the construction industry which is to improve the social, economic and environmental performance (Stewart, 2012).

2.2 Sustainable Construction

Sustainable construction is formally defined in Brundtland report as development that meets the needs of the current present without compromising the ability of the future generations fulfilling their own needs (Haselbash, 2008). The concept of sustainable construction governs three main pillars which are environmental protection, social well-being and economic sustainability. Sustainable construction aims to achieve a balance between protecting the environment and maintaining a continuous development (Vern, 2011).

Sustainable construction is about creating infrastructure and construction method that are environmentally friendly, do not overconsumption on our diminishing natural resources and conserve virgin materials (Suliman, 2009). It is also describes the responsibility of the construction industry to attain sustainability (Zainul, 2009). Sustainable construction is strategy used to minimize the waste, less non-renewable resources, energy efficient use and mineral resources.

The approach of sustainable construction will enable all the construction practitioners to be more concerned and responsible towards environmental protection needs without ignoring both social and economy aspects in striving a better life (Abidin, 2009).

Sustainable construction is strategy to enhance the quality of living, work and leisure environments for the individuals and communities. Sustainability in construction industry is highly important for the continuity of live. Considering that, Osso (1996) stated that sustainability is aimed to be able to provide to future generation in the next century by protecting the natural and built environment and taking care the continuance of both human beings and natural resources.
2.3 Sustainability Concept

Sustainability aims to meet the present needs or demands without compromising the ability of the future generations to meet their own needs. In attaining the sustainability, sustainable construction concept consisting of 3 pillars of sustainability which are environmental sustainability, economic sustainability and social sustainability. Sustainable construction is an effort and as a way in achieving sustainable development (Zainul, 2010).

2.3.1 Environmental Sustainability

Environmental sustainability is highlighting on the improvements of air and water quality, minimizing waste and water consumption, efficient use of natural resources, ecological protection and the prevention on harmful and potential effects on the environment. By other words, environmental sustainability is giving the world to future generation without making any destruction and decreasing the quality of future life by protecting the ecological and natural systems (Sev, 2007). It is concerning about environmental protection and the natural environment. Thus, the built environment which referring to activities involving construction industry, need to be handled effectively or otherwise it will give serious impact on the environment and the vision of achieving sustainable world cannot be achieve.

2.3.2 Economic Sustainability

Construction industry plays a significant role in contributing towards economic growth of our country, Malaysia. The construction industry sector has contributed 3.8% to country’s GDP (Department of Statistics Malaysia, 2014). Hence, the growth of construction industry have to be sustained to continue the economic growth. Economic sustainability is concerning about the money gained from the projects which benefits the clients, construction players, public and government (Abidin, 2007). A sustainable development requires minimizing the cost by increasing the efficiency in resources and energy consumption. Also, it requiring the creation of new market and opportunities. To sum up, both public and private sector with a steady
investment flow, efficient usage and management of resources that is assessment of economic efficiency with social criteria instead of organization profitableness is the provisions towards economic sustainability (Hoskara, 2007).

2.3.3 Social Sustainability

In achieving sustainability, social sustainability is the most important target that need to be focuses on some basics right and freedom related to the human beings. Social sustainability involves a great significance areas such like human rights, fair labor practices, human health and safety and wellness (Giudice, 2015). Therefore, social sustainability is one of the aspect that highly important in sustainability which provide basic requirements for the human beings such house, education, works, health conditions and cultural activities for each of the individual. It also increases the quality of life and promote the development of appropriate institutional framework. At the same time, it keeps protecting the right for the future generations.

2.4 Sustainability And Construction Industry

Construction industry has been associate with depletion of resources, destruction, solid waste disposal, emissions of greenhouse gas and serious environmental problems like deforestation, pollution and loss of biodiversity. In meeting those needs and demands during civilization, a lot of buildings need to be construct. Hence, both sustainability and construction industry are link to each other. The continuous development without implementing sustainability concept may affect the future generations. Therefore, construction professionals play a major role in sustaining our environment (Khatib, 2016).

Sustainability by means the usage of natural resources in an equilibrium way that do not reach decay, depletion and hand it down to the next generations by developing them. Construction industry contributes the largest opportunity to affects the environment. However, sustainable construction practices can reduce the impacts (Robichaud et. al., 2008). The aim of
sustainability is to be able to exist generation in the next century by protecting the natural and built environment and also taking care of continuity of human beings and natural resources.

The sustainability have become a worldwide attention since the introduction of Brundtland report in 1987 which led to growing awareness and acceptance towards responsible approach to the environment (Abidin, 2008). Ever since that, many progressive world events had taken place to increase the awareness on environment and sustainability agenda such as Rio Earth Summit 1992, Maastricht Treaty 1992, Kyoto Conference on Global Warming 1997, Johannesburg Earth Summit 2002, and Washington Earth Observation Summit 2003 (Abidin, 2005). Thus, in attaining sustainability, the subset to this philosophy is sustainable construction which will described the responsibilities of the developers in construction industry towards sustainability and make a strong contribution to a better future life (Dincer et. al., 2010).

2.4.1 Malaysian Construction Efforts On Sustainable Construction

Generally, sustainable and built environment have been associated to one another. Sustainable construction can be considered as a future investment as it is a way for the built environment to achieve sustainable development which taking into account environment, economic and social issues. Heading towards Vision 2020, Malaysia is a developing country that consider a long term strategies to assist the achievement of national goals. One of the basic visions that emerged for this country is to be ecologically sustainable (Abidin, 2009).

Promoting sustainable construction is the major part of Government’s policy on sustainable development (Suliman, 2009). A corporation established with the main function developing, improving and expanding the Malaysian construction industry, the CIDB Malaysia has identified environment and other sustainability related issues as one of the top issues of the construction industry (CIDB, 2000). Several workshops, dialogues and discussions are organized by CIDB Malaysia to systematically address and prioritize the environmental needs in construction sector (CIDB, 2007).

In order to raise awareness and promote sustainable application among project developers, several programs have been initiated by the government, professional’s bodies and private organization. For example, program called “SURIA 1000 for Developers” has been introduced to the Malaysian developers to be involved in total sustainable housing development
via the use of Building Integrated Photovoltaic (BIPV). “SURIA 1000 for Developers” is a renewable energy programmed to generate clean electricity from solar energy.

In 2009, The Board of Architects Malaysia or Persatuan Arkitek Malaysia have collaborate with the Association of Consulting Engineers Malaysia (ACEM) to launch a rating system known as Green Building Index (GBI) Malaysia to lead Malaysia property towards more environment-friendly. This such an opportunities for developers to design and construct green, sustainable buildings that can conserve energy and water, healthier indoor environment and adaptation of recycling and greenery in the projects via Green Building Index (GBI) Malaysia.

### 2.5 Benefits Of Sustainable Construction

The benefits of sustainable construction are acknowledged once the construction practitioners begin to appreciate the concept of sustainability. Significant benefits can be obtained through sustainable construction that are reduction use of energy and water. It benefits to environment by conserving the resources and the pollutions such noise, water or air pollutions can be reduced. Either way, it is also result in substantial cost saving over the lifetime of the building structure due to costs of energy and water which likely to rise in future. The greater savings can be done in a long term once sustainable buildings are being implement. Examples for sustainable projects are harvesting of rainwater for flushing toilets, using of the ground energy for the heating, natural ventilation and schemes.

Sustainable construction is the application of sustainable development to the construction industry (Preece et. al., 2011). Sustainable is a way to use natural resources efficiently, creating a healthier building that can improve the quality of human life, build a better surrounding environment and provide cost savings. Thus, the sustainable construction practices can preserve the surrounding environment in a long run, saving the natural resources, increasing the business growth and making the community more concern to the pollution threats if the practices being implement seriously.

Implementation of sustainable construction can reduce the demand of natural resources because the re-use of existing buildings or structures. By reducing the use and demand of natural resources, it also reduce the emissions and nuisance from the construction activities.
Good design of a building minimize the waste and the waste disposal can be controlled. This will encourage the better use of resources and help to relive the pressure on landfill facilities (Suliman, 2009).

### 2.6 Principles Issues On Sustainable Construction

The principles of sustainable construction is dynamic and various efforts have been made to examine several definitions of sustainability. According to Adetunji (2005), principles of sustainable construction has related in published work by Killbert (1994), Hill (1994), Hill and Bowen (1997), Robert (1995), Graham (2000), DETR (2000) and Long (2001). Table 1 shows the examples of principles of sustainable construction which is about synergistic relationship between economic, social and environmental aspects.

**Table 2.1: Principles of sustainable construction**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Proposed Principles for Sustainable Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DETR (2000)</strong></td>
<td>To minimize the impacts on environment and consumption of natural resources and energy, achieve satisfaction and best value for both clients and customers, profitability and competitiveness, respect and treat the stakeholder fairly</td>
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<tr>
<td><strong>Hill and Bowen (1997)</strong></td>
<td>Consists of four pillars that are contained within a set of over-arching, process oriented principles.</td>
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<td>Social pillar: To improve the quality of life, protect and promote human health and provision for social self-determination and cultural diversity.</td>
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<td>Economic pillar: ensure the affordability, employment creation, enhance competitiveness, and adopt full cost accounting and sustainable supply chain management.</td>
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<td>Biophysical pillar: Efficient use on water, energy, material and land consumption, and waste management.</td>
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</tbody>
</table>
Technical pillar: construct a durable, functional and quality structure for the construction.

| Miyatake (1999) | To maximize the resources of use, minimizing the resource consumption, practice use or renewable and recyclable resources, protection of the natural environment, create a healthy environment and pursue quality in creating the built environment. |
| Cole and Larsson (1999) | To reduce the consumption of natural resources such energy, land, water and materials, environmental loadings (gas emission, solid waste, liquid waste) and to improve the quality of indoor environment (air, thermal and visual quality) |

In delivering sustainable construction, it requires the understanding of the principles itself. The principles of sustainable construction act as a comprehensive guide to enables the construction player to be more responsible in environmental protection and also without neglecting the social and economic aspects in striving a better living (Abidin, 2008).