A FRAMEWORK FOR INTEGRATING SUSTAINABILITY INTO THE PROJECT PLANNING PROCESS FOR BUILDINGS: THE CASE OF MALAYSIA

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ABSTRACT

The growth of urbanization in Malaysia has led to a greater demand of construction projects especially for building development. The demand has created pressure on the sustainability issues especially in urban area of the country. There are many efforts relating to sustainability integration in building projects have been implemented in Malaysia. Unfortunately, till now the issues of unsustainable building projects in the county are likely to persist. This denotes that there is a gap between the field of sustainability and the integration practices within Malaysian building projects. In the absent of a proper sustainability integration framework, thus, this research aims to develop an appropriate framework to integrate sustainability into the buildings' project planning process towards delivering successful sustainable buildings in the country. Several research methodologies were used to achieve a thorough study for this research which are quantitative, qualitative and case study approach (mixed-methods).

The findings of literature review were synthesized to formulate a preliminary framework of Integrating Sustainability into the Project Planning Process. The framework consists of the lists of sustainability principles of building (29 factors) and the strategies to integrate the principles into the project planning process (21 factors). The fifty (50) factors have gone through refining processes by involving 188 Malaysian project stakeholders. Quantitative survey was employed to elicit this knowledge. The framework was then brought into the case study and qualitative phase for further refining process and the external validation. The framework was also applied to the chosen three case study projects to identify the practicality. The final proposal devised at the end of this thesis comes in the form of a 'Framework of Integrating Sustainability into the Project Planning Process' with the remaining of 42 validated factors. The proposed framework will provide a better understanding to the project stakeholders on the sustainability principles of buildings and to expose them to the strategies to integrate the principles into the project planning process. Findings suggest significant connections exist between the level of project performances and the practices of the sustainability integration factors as proposed in the framework. It is remarkable that excellent performance of a sustainable building project is achieved when the sustainability principles are integrated efficiently into the project planning process. The thesis outcomes could provide an essential guide during the planning process towards delivering a successful sustainable building project in Malaysia in the future.

ABSTRAK

Kepesatan pembangunan di Malaysia telah mendorong kepada meningkatnya permintaan projek-projek pembinaan khususnya bangunan. Permintaan tersebut telah mewujudnya isu-isu berkaitan kelestarian di negara ini terutamanya di kawasan-kawasan bandar. Pelbagai usaha untuk mengintegrasikan kelestarian ke dalam projek-projek pembinaan bangunan telah dilaksanakan di Malaysia. Malangnya, sehingga kini isi-isu ketidaklestarian bangunan di negara ini masih berleluasa. Ini menunjukkan hadirnya jurang di antara konteks kelestarian yang ingin dicapai dengan praktis semasa dalam mengintegrasikan kelestarian ke dalam projek-projek pembinaan bangunan di Malaysia. Justeru, ketiadaan kerangka yang jelas, kajian ini telah dibuat dengan tujuan utamanya adalah untuk menyediakan satu kerangka yang bersesuaian bagi membolehkan prinsip-prinsip lestari diintegrasi secara berkesan ke dalam proses-proses perancangan projek pembinaan ke arah merealisasikan bangunan-bangunan lestari di negera ini. Beberapa metodologi telah digunapakai bagi mendapatkan hasil kajian yang menyeluruh iaitu kaedah kuantitatif, kualitatif dan kajian kes (metodologi campuran).

Daripada hasil penemuan kajian literatur, satu kerangka awalan untuk mengintegrasikan kelestarian ke dalam proses perancangan projek telah dirumuskan. Kerangka tersebut menggariskan senarai prinsip-prinsip bangunan lestari (29 faktor) dan strategi-strategi untuk mengintegrasikan prinsip-prinsip tersebut ke dalam proses perancangan projek (21 faktor). Faktor-faktor yang dicadangkan dalam kerangka tersebut (50 faktor) kemudiannya diperhalusi oleh 188 responden yang terdiri daripada pihak-pihak yang terlibat dengan projek pembinaan bangunan di Malaysia. Kaedah pengumpulan data kuantitatif telah diaplikasi untuk mendapatkan maklumat-maklumat yang diperlukan. Kerangka yang terhasil daripada kaedah ini kemudiannya dibawa ke fasa kajian kes dan kualitatif analisis untuk terus diperhalusi dan disahkan. Kerangka tersebut juga telah diaplikasikan dalam tiga projek yang telah dipilih sebagai kajian kes bagi mengenalpasti kesesuaiannya untuk dipraktiskan. Hasil akhir tesis ini ialah dalam bentuk satu kerangka yang mengesyorkan panduan-panduan yang perlu dilaksanakan untuk mengintegrasi kelestarian ke dalam proses perancangan projek yang terdiri daripada 42 faktor yang telah disahkan. Kerangka tersebut akan membolehkan pihak-pihak yang terlibat dengan projek-projek pembinaan di negara ini untuk lebih memahami tentang prinsip-prinsip bangunan lestari serta mendedahkan kepada mereka tentang strategi-strategi yang perlu dilaksanakan semasa proses perancangan projek untuk tujuan mengintegrasi kelestarian

dengan berkesan. Hasil kajian menunjukkan bahawa terdapat hubungan yang signifikan di antara tahap pencapaian projek dan pelaksanaan faktor-faktor mengintegrasi kelestarian ke dalam projek pembinaan bangunan seperti yang disenaraikan di dalam kerangka yang dicadangkan. Kesimpulannya, tahap pencapaian projek pembinaan bangunan yang baik akan dapat dicapai sekiranya prinsip-prinsip lestari diintegrasi dengan cara yang berkesan ke dalam proses perancangan projek tersebut. Hasil kajian ini dapat menjadi panduan untuk digunapakai semasa proses perancangan dilaksanakan bagi merealisasikan projek-projek pembinaan bangunan yang lestari di Malaysia pada masa akan datang.

TABLE OF CONTENTS

CHAPTER THREE: SUSTAINABILITY IN MALAYSIAN BUILDING PROJECTS

CHAPTER FOUR: RESEARCH METHODOLOGY

CHAPTER FIVE: RESEARCH FINDINGS: QUANTITATIVE ANALYSIS

CHAPTER SIX: RESEARCH FINDINGS: CROSS CASE ANALYSIS

CHAPTER SEVEN: CONCLUSIONS AND RECOMMENDATIONS

LIST OF FIGURES

LIST OF TABLES

LIST OF SYMBOLS AND ABBREVIATIONS

ABCSE	Australian Bussiness Council for Sustainable Energy
ACEM	Association of Consulting Engineers Malaysia
AEA	ASEAN Energy Award
APEC	Asia–Pacific Economic Cooperation
APM	Association for Project Management
ASEAN	Association of Southeast Asian Nations
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
BCA	Building and Construction Authority Singapore
BEI	Building Energy Index
BRE	Building Research Establishment
BREEAM	Building Research Establishment Environmental Assessment Method
CAFOD	Catholic Aid For Overseas Development
CETDEM	Centre for Environment, Technology and Development, Malaysia
CIMP	Construction Industry Master Plan
CIDB	Construction Industry Development Board Malaysia
CIOB	The Chartered Institute of Building
C&S	Civil and structure
CO_2	Carbon Dioxide
COP	Conference of the Parties to the United Nations Framework Convention on Climate Change
CSD	Commission on Sustainable Development
DANIDA	Danish Agency for Development Assistance
DETR	Department of the Environment Transport and The Regions
DECC	Department of Energy and Climate Change, UK
DEFRA	Department of Environment, Food and Rural Affair, UK
DfT	Department for Transport, UK
EE	Energy efficient
EIA	Environmental Impact Assessment
FDTCP	Federal Department of Town and Country Planning
GBCA	Green Building Council of Australia
GBI	Green Building Index
GDP	Gross Domestic Product
GEO	Green Energy Office
GHG	Greenhouse Gases
GreenTech	Malaysia Green Technology Corporation
GRI	Global Reporting Initiatives
GSB	Greenbuildingindex Sdn. Bhd.
GW	Gigawatt
IAEA	International Atomic Energy Agency
iiSBE	International Initiative for a Sustainable Built Environment
INSPEN	National Institution of Valuation, Malaysia
IPCC	Intergovernmental Panel on Climate Change
JPI	Johannesburg Plan of Implementation
KeTTHA	Kementerian Tenaga, Teknologi Hijau dan Air (Ministry of Energy, Green Technology and Water Malaysia)
KPT	Kementerian Pengajian Tinggi (Ministry of Higher Education)
KPKT	Kementerian Perumahan dan Kerajaan Tempatan (Ministry of Housing and Local Government of Malaysia)
ktoe	Kilotonne of oil equivalent
kW	Kilowatt
kWh	Kilowatt-hour

kWp	Kilowatt-peak
LEED	Leadership in Energy and Environmental Design
LED	light-emitting diode
LEO	Low Energy Office
MaSC	Managing Sustainable Companies
MASTIC	Malaysian Science and Technology Information Centre
MBIPV	Malaysia Building Integrated Photovoltaic
MDGs	Millennium Development Goals
M&E	Mechanical and Electrical
MECM	Ministry of Energy Communications and Multimedia Malaysia,
MEWC	Ministry of Energy, Water and Communication Malaysia
MIP	Malaysian Institute of Planners
MS1525:2001	Malaysian Standard: Code of Practice on Energy Efficiency and Use of Renewable Energy for Non Residential Buildings: 2001
MS1525:2007	Malaysian Standard: Code of Practice on Energy Efficiency and Use of Renewable Energy for Non Residential Buildings: 2007
Mtoe	Million tonnes of oil equivalent
MW	Megawatt
MYR	Malaysian ringgit
NGO	non-governmental organisation
OTTV	Overall Thermal Transfer Value
PAM	Pertubuhan Arkitek Malaysia (Board of Architects Malaysia)
PB	Pendirian Bangunan (Building Development Plan)
PjH	Putrajaya Holdings
PjC	Putrajaya Corporation
PKK	Pusat Khidmat Kontraktor (Contractor Service Centre Malaysia, Ministry of Works)
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute,
PPB	Putra Perdana Berhad
PPC	Putrajaya Perdana Construction sdn. Bhd.
PTM	Pusat Tenaga Malaysia (Malaysia Energy Centre)
PV	Photovoltaic
PWC	PriceWaterhouseCoopers
RE	Renewable Energy
REHDA	Real Estate and Housing Developers' Association of Malaysia
ROI	Return on Investment
SBTool	The Sustainable Building Tool
SDIs	Sustainability Indicators
ST	Suruhanjaya Tenaga (Energy Commission Malaysia)
TBL	Triple Bottom Line
TWh	Terawatt-hours
UBBL	Uniform Building Bylaws
UN	United Nation
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNDP-GEF	United Nations Development Programme-Global Environment Facility
UNEP	United Nations Environment Programme
UNFCC	United Nations Framework Convention on Climate Change
US	United States
USGBC	U.S Green Building Council
UV	Ultra Violet
VOC	Volatile Organic Compound
W	Watt
WCED	World Commission on Environment and Development

LIST OF APPENDICES

CHAPTER ONE

RESEARCH OVERVIEW

1.1 INTRODUCTION

This chapter presents the background of the research, giving the detailed explanation of its subject, and its aims and objectives, research questions, problems statement and gaps of the research. The summary of research methodology, scope, research significance, and structure of the research are also discussed in this chapter.

This research concentrates on the topic of integrating sustainability into the project planning process for Malaysian buildings. As the researcher was a town planner in a government and a private organization several years ago, the building project planning process and the challenges in integrating sustainability into the projects is quite familiar to her. The knowledge of town planning during her bachelor degree and the knowledge project management during her master's studies also made her convenience with this research topic. Both of knowledge are related and complement each other towards delivering an excellent sustainable built environment. It was her own initiative to join the Malaysian Green Building Confederation (MGBC) for their Green Building Index (GBI) facilitator program in April 2012 and registered to be an academic member of MGBC for the detail knowledge and practice of sustainable building in Malaysia. She realized that sustainability in building is not a simple fusion of green design, techniques and materials but it is a holistic solution to achieve the concept of sustainable development throughout the project life cycle.

1.2 BACKGROUND OF STUDY

There are many challenges facing the world today, among them are sustainable development, which has received encouraging attention since Rio Declaration on Environment and Development was signed up in 1992 Earth Summit. The Rio Summit agreed a set of action points for sustainable development, collectively referred to as Agenda 21 (agenda for 21st century), and government that signed up to these have committed themselves to action (Bell and Morse, 1999). Since then, many works have been carried out on sustainable development to promote balance between the need to

continue in business, without seeking profitability at the expense of the environment and society's needs (MaSC, 2002).

In Malaysia context, the focus on sustainable development, especially in devising policies, has been spelled out in government policies at national, state and local level as evidenced in Seventh (1996-2000), Eight (2001-2005), Ninth (2006-2010) and Tenth Malaysia Plans (2011-2015). According to Choo (1999), consideration for sustainable development has gained recognition and integrated in Malaysian government policies and legislation since 1970's. However, the sustainability dimensions pursued were heavily skewed towards economic and social gains. The statement that recognized the needs for preservation of environment as a result of rapid land, urban and industrial development only appeared in the Third Malaysia Plan (1971-1975). Since then, the stress for proper environmental management and balancing economic with environmental objectives was outlined in consequent development plans (Choo, 1999).

The growing awareness of a sustainable development's potential and benefits result in dramatic increases in the demand of a sustainable construction project (Robichaud and Anantatmula, 2011, Zainul Abidin, 2009). Sustainability in construction is believed to improve the project performance (Zainul Abidin, 2010; Zainul Abidin and Pasquire, 2007; Harris et al., 2001; Kamara et al., 2001), such as, increasing the quality of the output, productivity and profitability, whole life cost reduction and business enhancement (Hayles, 2004; The Economist, 2004). Many worldwide practitioners are beginning to appreciates sustainability and acknowledge the advantages of building sustainable. Four years after the Rio declaration, the International Organization for Standardization (ISO) established ISO 14000 to address the operational standards that relate to the environment and the standard was updated in 2004 to meet the environmental challenges face in the 21st century. Currently, compliance to the new standard is voluntary in most countries worldwide. More property companies have since applied for certification and invited their partners and vendors to do the same. Some of them changed their energy consumption patterns, while others even redesigned their buildings and facilities to take advantage of natural lighting or to use solar power (Mochal and Krasnoff, 2010).

The term of 'sustainable building' is increasingly important to tenants, owners and property developers (Newell and Manaf, 2008). More local governments worldwide are

adopting green and sustainable building standards and regulations or providing financial incentives for sustainable development. Some researchers believe that the concept of sustainability in building cost lower than conventional method and saves energy through efficient resource use, higher productivity and reduced risk (Yates, 2001). On the other hand, some of them suggested that sustainable buildings cost more to construct than conventional building, which is in the range of 5% to 7.5% to construction cost to be recovered in five to eight years (CBRE, 2009; Building Science Corporation, 2008). Thus, even if it is widely held that the longer term cost savings in the operation and maintenance of the building enables a recovery of the initial cost, (USGBC, 2006a; 2006b), unfortunately, the benefits of operational savings are no longer important, especially to speculative developers who have no long term interest in operating or leasing a building (Robichaud and Anantatmula, 2011; Choi, 2009).

Heerwagen (2000) and Bartlett and Howard (2000) highlighted that sustainability in building will contribute positively to better quality of life, work efficiency and healthy work environment. Whereby, Yates (2001) who explored the business benefits of sustainability concluded that the benefits are diverse and potentially very significant. The approach of sustainable construction will enable the construction players to be more responsible to the environmental protection needs without neglecting the social and economic needs in striving for better living.

Although there are many researches on the paybacks of sustainability in building project, nevertheless, huge numbers of barriers also contributes to the multiple failing of the projects within the market. Building projects are still dealing with heightened perceptions of the risks related to sustainability, especially the need for managing the project with tighter budgets, profit margins (Robichaud and Anantatmula, 2011; Choi, 2009) and schedules (Doyle, 2009). Sustainability integration in building projects are claimed to carry the risk of a higher first cost and financial constraints associated due to the requirement of more time to design, the need to bring together appropriately skilled professionals (Doyle et al., 2009), the need to study sustainability aspects of buildings and become familiar with research reports, the preparedness to take risks in developing new building prototypes (Choi, 2009; Francis et al., 2009; McKee, 1998), the need for a proper understanding of the relationship between capital and the running costs in financial, energy and environmental terms (Francis et al., 2009), personnel hours (Korkmaz et al., 2010) and the use of innovative materials and technologies (Korkmaz

et al., 2010; CBRE, 2009; McKee, 1998). A survey among several building industry professionals conducted by McGraw-Hill Construction (2006) evidenced that perception of 'higher costs' or 'increase in the project first cost' is the most commonly found barrier to the sustainable building project. Added to that, there are problems which parallel to those of the sustainable client including time required for the design in relation to the client programme and fee, the risks and costs of innovation especially against competitive fee scale, the need to develop and test prototypes, the need to manage contractor/sub-contractor relationships and understanding, problems with certain contract forms such as design and build, the need for feedback and monitoring to inform new projects, lack of coherent government initiatives, lack of consistent performance standard and feedback and the lack of exemplar projects (Francis, 1998).

Robichaud and Anantatmula (2011) pointed out that sustainability integration in construction project will improves its chances for financial success if a cross-disciplines team is involved at the earliest planning stages and throughout the project. In project management, there is no any clear aspect concerning sustainability in project planning standards and guidelines was revealed (Wu and Low, 2010 and Grevelman and Kluiswara, 2010). The alignment between the aspects of project management and sustainability is still very rare and there is almost no attention for the integration of sustainability in project management (Labuschagne and Brent, 2005). Lack of collaboration and integration among project stakeholders caused of communication loss among them and become one of the reasons of project failure (Grevelman and Kluiswara, 2010; Muldavin, 2010; Choi, 2009). There are also lack of knowledge, expertise and awareness of sustainability and the integration process among the project stakeholders which ultimately cause of project delay (Choi, 2009; Doyle et al., 2009; Zainul Abidin, 2009)

Sustainable building projects are naturally different from conventional projects due to the requirement of special materials and building practices, as well as the management commitment to sustainability. Thus, sustainability in building project requires additional considerations on many aspects more than the conventional project. Choi (2009) highlighted that most sustainability integration in building projects do not meet their targets due to the failure of their planning process and practice. Conventional projects are completed in isolation that is built using the tools and techniques itemized in PMBOK. Sustainability principles, however mentioned that nothing sustainable can

occur in isolation and that to ensure sustainable development one must continuously examine one's activities in the light of their surroundings economic, social and environmental (Labuschagne and Brent, 2005). The current theoretical frameworks of sustainability do not efficiently take social and economic sustainability issues into account, it is often encouraged environmental measure in most cases for instance in the selection of materials and technology for construction project yet the rest of measure are less promoted (Francis et.al, 2009; Labuschagne and Brent, 2005). Recently, we have been introduced to Green Project Management (GreenPM) which encourages people who involve in project management to start taking the environment into account during the decision making process, its methodologies and processes (Mochal and Krasnoff, 2008). GreenPM considered various operational elements, such as responsibilities, authorities, procedures and resources. Even though GreenPM was observed as a good start for incorporating sustainability principles into project management process, but it was noticed to appreciate only on environmental consideration. This idea seems unappreciated the rest two of the bottom lines of sustainable development which are economic and social consideration.

Sustainability integration in building involves a holistic solution to achieve the concept of sustainable development throughout the project life cycle. Although the life-cycle concept is adopted by a majority of the professionals, but most concentration currently were tend to skewed on the design and technical related areas which is against the concept of sustainability itself. The term of 'sustainable' is always being diluted by the commercialization and marketing of the green movement. Both the words 'green building' and 'sustainable building' are often used synonymously and interchangeably. It was argued to be confusing people in understanding and practicing the terms (CBRE, 2009 and Schumann, 2010).

There are many intellectual publications on the subject of sustainable building, but the ones that relate to the sustainability integration into the planning process of the project are very few. Several papers were discussed the importance of planning process towards integrating sustainability in building projects. These papers however were more theoretical-based than research-based. The fact is, it is a definite need to develop a framework for integrating sustainability into the project planning process for buildings. The sustainability principles of building should also to be identified in order to provide a clear sustainability guideline for the stakeholders throughout the integration process.

Significant adjustments to the conventional project planning process should to be explored. It is also important to explore the strategies for containing cost during the planning phase of the project to reduce developers first cost in delivering the sustainable building project (Korkmaz et al., 2010).

Sustainability in building projects will only results from building professionals working together to achieve this common objective and clients who are sympathetic to this ideal, user who understands and values the concepts and designers and contractors who as a team evolve the design with a sustainable outlook (Edward, 1998). A good planning process allows everyone involved to understand and perform their part in the project. It also serves as a monitoring tool, allowing early action to be taken if things go wrong (HRDC, 2003).

1.2.1 The Need to Study Sustainability in Building Project

Building sector is the largest (40%) sources of greenhouse gas emission worldwide (Jalendran, 2011; Wu and Low, 2010). In 2003, 44% of carbon emissions in the United Kingdom were generated by buildings (CBRE, 2009). Building sector consumes about one-third of the world's energy (Wu and Low, 2010). Buildings also responsible for 40% of solid waste generation globally and utilized a quarter of the world's resources. Building use 12% of the world's water and contribute up to five times more pollutions in its indoor air quality than outdoor air (Jallendran, 2011). Malaysian urban population is expected to grow more than 80% of total Malaysian population by 2030 parallel with their consumption of energy and resources as well as their carbon emission contribution (GSB, 2012a). Opportunely, many researches show that sustainable building can considerably reduce the consumption of energy and in turn reducing the carbon emissions (Robichaud and Anantatmula, 2011). Capital costs also are not higher for many sustainable building elements and even where upfront costs are more elevated, they can be offset by decreased operational costs (Yates, 2001). Therefore, the encouragement and serious attention towards sustainability integration in building project implementation is seen very urgent in order to overcome or reduce the conventional building phenomenon in a hyper urbanization as Malaysia is one of the fastest growing building industry in the world (ABCSE, 2007) with the current urban population of nearly 70% (GSB, 2012).

1.2.2 The Need to Study Sustainability Integration into the Project Planning Process

A major part of the activities performed in construction project management deal with initiating, planning, executing, monitoring and controlling the project (Zwikael, 2009; PMI, 2008; Clement and Gido, 2006; Clark, 2002). However, planning process is claimed to be a critical to successful accomplishment of a project through establishing and implementing a well-thought plan as a whole project is going according to its plan (Zainul Abidin, 2009; Clement and Gido, 2006). Particularly, this study focuses on the sustainability integration into the project planning process for buildings, because of its high importance in determining project success (Zwikael et al, 2005 and Kerzner, 2003), or in this study, 'project success' is referred to 'sustainable building project success'. Wu and Low, (2010:68) highlighted that, 'the planning session during the pre-design stage is of critical importance to realize the goal of sustainability because it is the starting point to achieve sustainability.' Project planning process require the longest time of process in project management which is approximately 35% of the project manager's time over the life of the project (Clark, 2002). Through project planning, project manager need to think through the project and remain focused on the end goal, which is the final deliverable. Planning process is time to be more detailed in describing the project. Zwikael (2009:375) stated that, 'Project planning is defined as the establishment of a set of directions insufficient detail to tell the project team exactly what must be done, when it must be done and what resources to use in order to produce the deliverables of the project successfully'. Thus, as one of the important process conducted in managing the whole life of building projects, the researcher believes that the planning process holds the strategic position to integrate sustainability into building projects. The researcher agrees that successful sustainability integration in building project starts with planning. This argument was supported by most researchers and writers including BCA (2007) and Hayles (2004) who also accentuated that sustainability practices in construction project would improve project performance. Consequently, project planning is observed to be a key factor in achieving sustainability. This proclamation is supported by Zainul Abidin (2009:812) as she stated based on her study, that planning is the most critical stage to incorporate the concept of 'sustainability' to have the most effect on the overall pursuit of the project. She further argued that, incorporation of this concept after planning stage will be seen as a burden and most likely will add more cost to the budget. In this research, therefore, explore on