ISSN:1991-8178

Australian Journal of Basic and Applied Sciences

Journal home page: www.ajbasweb.com

Sustainability Integration through Project Planning Process of GEO Building Project

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ARTICLE INFO

Article history:
Received 12 October 2014
Received in revised form 26 December 2014
Accepted 17 January 2015
Available online 28 February 2015

Keywords:
Sustainable building, planning process, integrated design, project performance

ABSTRACT

Sustainable building is a complex and holistic development idea. The level of complexities and innovation needed in this project are only possible through implementation of efficient sustainability integration strategies throughout the project planning process. In Malaysia, project planning process is sequential. Lack of integration in this process is believed to be a source of poor project performance and a major cause of adversarial relationships among project stakeholders. For that reason, this study attempts to explore the factors that enable sustainability to be integrated successfully into Malaysian building through the project planning process. The preliminary study in this research indicates 20 critical factors to integrate sustainability through the process. Using a case study method, this study shows that efficient sustainability integration factors throughout a project planning process will improve sustainability performance.

To Cite This Article: Nor Kalsum Mohd Isa, Anuar Alias, Zulkiflee Abdul Samad, Mohd Yazid Mohd Yunos, Mazdi Marzuki., Sustainability Integration through Project Planning Process of GEO Building Project. ***Aust. J. Basic & Appl. Sci.,*** *9(7): 189-192, 2015*

INTRODUCTION

Planning process is the strategic position to integrate sustainability principles to have the most sustainable effect on the overall building project (Perkins, D.F., 2011; Isa, N.K.M., 2014). This is the most crucial point in the sustainable project development that needs early involvement of various disciplines in decision making (Isa, N.K.M., 2014; Yudelson, J., 2009). This paper identifies 20 critical factors to integrate sustainability through project planning process according to the review of existing literature. The factors are; 1) sustainable concern during the establishment of project scope, project charter, drawing, contract and detailed project plan (Yudelson, J., 2009; Muldavin, S.R., 2010), 2) specific sustainability goals and project priorities (Yudelson, J., 2009; Robichaud, L.B., V.S. Anantatmula, 2011; Muldavin, S.R., 2010), 3) core knowledge of sustainable project among team members (Choi, C., 2009), 4) team members are educated on sustainability issues (Choi, C., 2009; Robichaud, L.B., V.S. Anantatmula, 2011), 5) team members are fully informed on sustainability goals and project priorities (Yudelson, J., 2009; Hwang, B.G., W.J. Ng, 2013), 6) team members' selection with sustainable development quality and capability (Hwang, B.G., W.J. Ng, 2013; Bal, M., 2013; Yudelson, J., 2009), 7) Appoint a sustainability coordinator for the project (Muldavin, S.R., 2010), 8) Involve a local community representative in the project (Perkins, D.F., 2011), 9) bring the team together as early as possible during planning process (Perkins, D.F., 2011; Yudelson, J., 2009; Robichaud, L.B., V.S. Anantatmula, 2011), 10) design should reflects the end user community (Isa, N.K.M., 2014; Choi, C., 2009; Muldavin, S.R., 2010), 11) sustainability and integrated design requirements are mentioned in the project documentations, strategic and comprehensive plan (Yudelson, J., 2009; Choi, C., 2009; Muldavin, S.R., 2010), 12) do whole building design and systems analysis (Choi, C., 2009; Isa, N.K.M., 2014), 13) committed and collaborative team (Yudelson, J., 2009; Choi, C., 2009), 14) involve diverse set of stakeholders on the team (Yudelson, J., 2009; Choi, C., 2009), 15) effective communication and incorporation of charette process (Yudelson, J., 2009; Hwang, B.G., W.J. Ng, 2013), 7) planning should reflects all the project stakeholders (Yudelson, J., 2009; Bal, M., 2013), 17) commissioning process is added during this process and described in a specific section (Yudelson, J., 2009; Bal, M., 2013), 18) government policies on sustainability (Choi, C., 2009), 19) incentive on sustainable project (Choi, C., 2009), 20) compliances with code and regulatory tool of sustainability (Choi, C., 2009; Muldavin, S.R., 2010).

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This study looks at a case study, a sustainable building showcase project in Malaysia - GEO building to explore their invaluable experiences in integrating sustainability into the project. GEO building is a demonstration project by Malaysia Energy Centre for commercially feasible examples of sustainable initiatives for modern buildings in Malaysia and the region. The project's objectives are 1) to achieve a sustainable office building, using green technology includes, energy efficiency (EE), renewable energy (RE) and water harvesting system, 2) to demonstrate grid connected Building Integrated Photovoltaics (BIPV) system and 3) to establish 10 to 15 years ahead some of the EE and RE technologies in Malaysian building industry. Due to some limitations, the sustainability integration factors measured in this study were limited to focus towards the project planning process at the conceptual and design stages.

Research Methodology:

This paper uses a case study research design and qualitative analysis to explore the sustainability integration factors that practiced in the case project and its impact towards sustainability performance of the project. The 20 factors identified in the literature review were evaluated throughout the case study method by the means of interviews and review of relevant documents. The respondents of this research are the project stakeholders, who have been directly involved in the planning and design process of GEO project. Inputs from them are useful to understand the sustainability integration factors implemented throughout the process and its influence towards sustainability performance of the project. Besides, the stakeholders of construction and operation and maintenance stage of the project were interviewed to measure the sustainability performance during the stages. Five project stakeholders were interviewed consisting of the owner (O2), energy consultant (E2), local authority (L2), contractor (C2) and energy manager (U2). The data for this study were also obtained through reviews of relevant project documents.

RESULTS AND DISCUSSION

[i] Sustainability Integration Factors during Planning Process of GEO Project:

According to the owner and energy consultant of GEO project, 18 out of 20 factors were practiced among the designers team during the project planning process. Two strategies were not practiced during the process includes; *'involve local community representative in the project'* and *'sustainability and integrated design requirements are mentioned in the project documentations, strategic and comprehensive plan* (O2,E2)*'.* Since the planning process at conceptual phase, the project goals, priorities and objectives for the GEO building were formulated to achieve zero energy consumption at the least construction costs. This project has implemented an integrated design concept. The selection priority of the team members was given based on their past experiences in sustainable projects (O2). An energy consultant was appointed since the initial stage of project planning process (O2, E2). The owner, architect, engineers and the energy consultant were brought into the project from the beginning in the planning process as the integrated design demanded an extremely integrated process (O2,E2). Owner's decision making role was very important in achieving the goal of the project. Similarly, the energy consultant was extremely needed to give inputs especially on EE, RE and other sustainability aspects (E2). However, due to the conventional contracting method, the contractor was not appointed until the project went to the construction stage (C2). Any issue related to the design and construction was raised during weekly progress meeting or technical meeting through an efficient charette process which also involved the conceptual and design stakeholders.

Local authority involvement was limited to make decision on the approval matters such as layout plan and building plan approval (L2). Local community representative was not involved in the project planning process. Although the practice has been suggested in the literature review (Choi, C., 2009, Isa, N.K.M., 2014, however it is unusual in the current Malaysian project planning process. Integrated design is still in its infancy for Malaysia. In GEO project, even though the sustainability integration factors was employed by the interviewees, but the requirements was not clearly mentioned in the project documents (O2,E2). It was contradicted with the available literature that suggested the requirements to be included in project documentations (Yudelson, J., 2009; Choi, C., 2009).

During operation and maintenance stage, the energy manager and the end users of the building are responsible to operate the building in sustainable manners. Although the energy manager did not directly join the planning process of the project as compared to the others, but he was always informed and trained by the owner's representative and the energy consultant on monitoring, maintaining and controlling the building systems (O2,U2). The project was given incentives by the government for tax reduction of imported sustainable materials. The project have received technical assistance from the Malaysian BIPV Project on the system design concept, tender preparation and evaluation, monitoring and for interconnection to the National Utility Company (O2,E2,U2). Overall, the sustainability integration factors that have been practiced during the planning process of GEO project was at a very high level.

[iii] The Sustainability Performances:

A list of 22 sustainability principles (Yudelson, J., 2009; Robichaud, L.B., V.S. Anantatmula, 2011; Isa, N.K.M., 2014) were used to measure the sustainability performance of the project: 1) optimize materials and resources used, 2) sustainable materials and resources, 3) energy efficient, 4) efficient water consumption, 5) noise control, 6) urban design, visual impact and aesthetic, 7) site planning, 8) transport management, 9) concern on quality of land and river, 10) air and emissions quality, 11) environmental management, 12) sustainable method, 13) economic benefit to the stakeholders, 14) improve local market presence, 15) whole life cost efficiency, 16) indirect economic impact, 17) health and safety, 18) training, education and awareness, 19) product responsibility, 20) stakeholders participation, 21) sustainable design, 22) sustainable innovation. Overall, the implementation of sustainability integration factors throughout the planning process of GEO building project has a positive impact towards sustainability performances of the project in every stage as follows;

Conceptual and Design Stages:

The owner and the energy consultant (O2,E2) placed at the 'excellent level' for the sustainability performances of the conceptual and design stages of GEO project. But, the local authority (L2) measured the project to be at the 'fair' level of achievement as their input was not considered during this stage. Local authority involvement was very limited during the project planning process (L2). Though, in overall, the sustainability performances of GEO project during these stages was measured to be at a 'good' level.

Construction Stage:

The contractor assessed the sustainability performances of GEO project during construction stage to be at the 'good' level. The contractor was not well exposed to the sustainability goals of the project (C2). It was quite worrying because contractor should really understand the goal of this project as they are indirectly responsible for implementing the design team's vision and holding the project specifications firm against change request (Robichaud, L.B., V.S. Anantatmula, 2011). Based on the arguments, the authors expect that GEO sustainability performances might has achieved an 'excellent' level if the contractor was involved since the early planning process.

Operation and Maintenance Stages:

Sustainability performance was measured to be delivered at an 'excellent' level during operation and maintenance stages. The building was claimed to be excellent mainly in the aspects of efficient environmental management, concern on quality of land and river, energy efficient, air and emissions quality, sustainable method, urban design, visual impact and aesthetic, noise control, whole life cost efficiency, economic benefit to the stakeholders, health and safety, product responsibility, training, education and awareness, stakeholders participation, sustainable design and sustainable innovation (U2,O2).

Summary:

This paper reveals that sustainability integration through planning process has a positive impact towards sustainability performance of the project. The fact was revealed by the GEO project which has practiced the integration factors through this approach. To deliver a sustainable building project, it is important to involve a collaborative team of various disciplines since the early planning process to collectively consider various aspects of sustainability and synergies and tradeoff them over the life cycle of a project. In particular, local rules and regulations need to be examined and understood during this phase, since failure to obtain the proper permits may cause significant project delays. The results of this study provide an indication that the greater efforts of sustainability integration since the initial planning stage by the means of efficient integration factors make a successful sustainable building project become feasible.

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