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Concept of Environmental Sustainability Awareness Strategies in Pre-Construction Stage

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Abstract

This paper presents an overview of the environmental sustainability concept through construction industry. The aim is to create a environmental sustainability through pre-construction stage. This could be achieved where as it is important to look into minimizing the impact on the environment. However, the enthusiasm in pursuing rapid development often causes environmental sustainability aspect being ignored. This research was conducted to study the level of environmental sustainability concern and practices in through pre-construction stage in construction industry. A selected of construction working managerial level were selected as respondents. Data were collected through a self-administered questionnaire. More than 70% respondents being interview and have high level of environmental concern but moderate level of environmental sustainability practices. Most of the respondents concern about environmental issues. The study also have positive perceptions on environmental sustainability. The findings showed that there is a positive and pro-active between the level of environmental sustainability concern and practices in construction management. This indicates that the higher the level of environmental concern, the higher the level of practices in environmental sustainability among project practitioners. The implication of the study showed that coordinate effort should be taken by construction practices during pre-construction stage to enhance environmental sustainability practices more effective through construction project

1. Introduction

Malaysia is aim at produce their buildings at sustainable. The demand for high performance 'sustainable' buildings is becoming more demand in the construction industry and need to attempt less environmental impact to the construction project. The construction industry should not exempt environmental issues, or at very least try to apply the basic principles of environmental sustainability. This paper presents the construction perspective of Malaysia and the developments in environmental sustainability. This research investigates the conceptual of awareness among construction industry key players on the environmental sustainability concept and environmental issues in the pre-construction stages.

2. Overview of Construction Industry

Today, the Malaysian Construction Industry plays an important role in generating wealth to the ccommunity and the development of social and economic infrastructure and buildings. Construction can be define as the progressive activity involved in repairing or constructing. It involves many stages such

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as planning, managing, organizing, conceptual, designing, material application and finally the finished product. Irurah (2001) defined that construction as site activity, as the comprehensive project cycle, as everything related to the business construction and as the broader process of human settlement creation. Planning process at the early stage is the main process application in managing the whole life of project (Zwikael et al., 2009). Building project is considered to be the highest demand in Malaysia as it forms about 68% of overall construction work (CIDB, 2008). The construction industry in developing countries states that the construction industry is an essential contributor to the process of development, influencing nearly every sector of the economy. Construction materials apply are also heavy and high in volume. Only recently has the idea of reducing and recovering construction materials been seen as an essential part of a global waste strategy (Bates, 2006). On the other hand, the issues of sustainability and green construction have been highlighted in the Construction Industry Master Plan (2005 – 2015) as being of significant importance for the Malaysian construction industry.

3. Defining Sustainable Construction

Sustainable issues has become a subject of increased and widespread global attention especially during the last two decades. Sustainable construction aims to product structures that enhance the quality of life and protect the environment efficiently and profitability. It also aims to achieve social progress and maintain economic growth and development (Kilbert, 1994). Delivering construction that sustainable need proactive action from all participation in construction and construction services.

Sustainable construction is a set of processes by which a profitable and competitive industry deliver built assets (buildings, structures, supporting infrastructure and their immediate surrounding) (GCCP, 2000). Wells (2003) stated that sustainability has three pillars as economic sustainability, environmental sustainability, and social sustainability.

4. Environmental Issues of Possible Concern

Environmental issues have become a serious and important agenda of discussion in society nowadays. In the local context, awareness on environmental issues amongst Malaysian were relatively low. In the present years, understanding and awareness on environmental issues among Malaysia need to be considered due to lack of exposure to environmental issues. Research by Zurina dan Norjan (2003) indicate that the community do not have a caring attitude towards environment. This statement emphasised when talking about environmental issues, we cannot avoid talking about pollution. Therefore the need to aware of the environment and its mitigation.

Environmental issues made Malaysia actively taking part in discussions on environmental issues not only regionally but also internationally.The 1989 Langkawi Declaration on the Environment. Gurmit Singh (2000) reported that the declaration was to discuss major environmental matters such as greenhouse effect, damage to the ozone layer, acid rain, sea pollution and land degradation. Malaysian is to be a sustainable country besides overcoming environmental problems.

The construction industry, an industry with a high negative impact on the environment, is one of the industries which has to become more sustainable. The environmental issues of possible concern during construction impacts that are common to many development projects (e.g. land use and environmental impacts), as well as specific impacts associated with the elements of the environmental sustainability. According to Tse and Raymond (2001) highlighted that environmental protection is an important issue throughout the world. As early as the 1980's, Malaysia had been making efforts to be actively involved in environmental issues.

Most of the potential environmental impacts during pre-construction are of a local nature. The potential environmental impacts during operation are mostly continuous, while those associated with construction activities are temporary and mostly reversible. Hence, it is important that to adapt to the concept of environmental sustainability in construction works. Environmental impact research studies by

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Rubin and Davidson (2001); Babawale (2004); CIOB (2004) and Majumdar (2006), are define where the implications of human activities on the environment.

Recent studies, UNEP (2003), Mitch et al. (2004), Salah E.H. (2007) and Haselbach, L.M. (2010) have attached an increasing significance to the idea of sustainable construction. Referring to the sustainable principles, environmental sustainability can be considered more "friendly" environmental materials, waste minimization, energy efficiency, reduced operational costs, increased lifetime span, and end-of life issues are important criteria for designers, and those aspects need to be considered starting with the early design stage, in order to make the building project "sustainable".

The origin concept of sustainable development without threatening the ability of future generations to meet their needs. The issues of sustainability deals with a wide range of factors within the local and global level (Gloet, 2006). According to Lapinski et al. (2006) mention that a sustainable buildings should be designed and constructed with emphasis to environmental consideration. While Halliday (2008) mentions a projects should create minimizing on polluting materials, treatments, fuels, management practices, energy and transport.

Planning process at the early stage is the strategic position to integrate environmental sustainability considerations to have the most sustainable solution on the overall of the project. According to Abeysundara et al. (2009), the application of materials is vital and the selected should be based on the materials' environmental impacts at the project planning and design phases.

5. The Interpretation of Environmental Sustainability Principles within Construction Industry

Construction activities are considered as a major contributor to environmental pollution (Augenbroe & Pearce, 1998; Chan & Chan, 2004; Ding, 2005; Hendrickson & Horvath, 2000; Yahya & Boussabaine, 2006; Yao, Shen, Hao, & Yam, 2007; Zimmermann, Althaus, & Haas, 2005). By integrating environmental requirements at pre-construction stages of the construction project, the aim adhere to the concept of sustainable development defined by the United Nation's Brundtland commission (WBCD, 1987), as "meeting the needs of the present without compromising the ability of future generations to meet their own needs". Sustainability become widely known as a result of the Brundtland report (1987). The sustainable principles is to show concern for people by ensuring they live in a healthy, safe and productive built environment and harmony with nature. It also improve the quality of buildings and services and minimizing damage to the environment and its resources. (Raynsford, 2000). The precautionary action where assessing risk and uncertainties before any action and rectify possible damage at source. Through the professional in management level, using technology and expert knowledge to seek information and improving project efficiency and effectiveness.

Considering an environmental issues such as using renewable resources in preference to non-renewable resources, maximizing resource reuse and/or recycling, minimizing air, land and water pollution at global and local levels (Hill and Bowen, 1997). Construction sector has major impacts on all three pillars of sustainable development: environment, society, and econom(Warnock, 2007; Pitt et al., 2009). CIB defined sustainable construction as: "Creating and operating a healthy built environment based on resource efficiency and ecological design" (Kibert 2005)

The construction is not only to deliver buildings and infrastructures, but pro-active to reduce the usage of resources and energy, minimize pollution and waste. Shen et al., (2005) have studied that the construction activities is a main source of environmental pollution The construction activity and demolition waste have a major impact on the environment. Pollution prevention must be considered during the construction process where as contribute significantly to environmental sustainability. Pollution also has an adverse impact on land, water and air. The construction industry also is a major contribution of the wastes. There are a lots of construction waste generated in the country because of rapid development in construction industry. Construction waste generation is becoming a major issue in Malaysia (Begum et. al, 2007; Begum et. al., 2010).Building construction and

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operations have huge effect on the environment (Levin, 1997).

Table 1: Literature review of environmental issues in construction industry

Environmental issues - Construction Industry	Authors & Year
Reducing emissions of greenhouse gases, moving away from disposal of waste towards waste reduction, recycling and recovery, consumer information, and encouraging movement in the market	Holton et al., 2007
Construction materials usage; energy and water usage; capital, operation, and maintenance costs; expenditures in research and development change; performance in building function; accessibility; health and safety acceptability	Sahely et al. 2005
Reducing CO2 emissions, energy-efficiency of buildings	Pinkse,Dommisse, 2008
Raw material extraction and consumption, land use change, including clearing of existing flora, energy use and associated emissions of greenhouse gases, aesthetic degradation, water use and waste water generation, increased transport needs,	Sev, 2009
Cultural, social and environmental ramifications around the indicators suggested by Building Research Establishment Environmental Assessment Method (BREEAM), UK, and Green Building Challenge (GBC).	Warnock, 2007
Consumption of energy and materials, generation of waste and dust, and pollution of air and water, numerous toxic wastes produced during the construction	Son et al., 2009
Resource consumption, environmental loadings	Matar et al., 2008
Human wellbeing (immediate), eco systemic wellbeing (delayed)	Du Plessis, 2007
Enhancing and better protecting the natural environment; and minimising its impact on the consumption of energy (especially carbonbased energy) and natural resources.	Pitt et al., 2009
Minimising waste, to put an end to its appalling record of pollution incidents, to integrate the supply-chain	Myers, 2005
Constructing buildings that are durable and long lasting, making future environment safe, making the materials from sustainable resources	Said et al., 2010
Use of fossil fuels, atmospheric pollution, loss of soil and agricultural land, loss of forests and natural habitats	Spence, Mulligan, 1995
Global warming potential, acidification, photochemical ozone creation, energy consumption, and waste creation	Ortiz et al., 2009
Reuse of materials in the construction industry and using eco-materials	Erlandsson, Levin, 2005
Environmental pollution.	Arjen et al., 2005
Life cycle assessment of dwellings; about 70-90 % of the environmental pressure stems from the use phase	Adalberth et al., 2001
water, resources, land use, and greenhouse gas emissions	(Pinkse, Domisse, 2008; Pitt et al., 2009),
effects on the environment by affecting transport systems, but it also affects communities and even public health	(Sev, 2009; Holton et al., 2007).
Environment (pollution of air & water, traffic), health & safety (disruption of life-quality), security, community engagement	Glass, Simmonds, 2007
Environment (Energy & Waste), safety, ISO 14001	Wenblad, 2001

Concerning environmental issues, Bon and Hutchinson, (2000) mentions that at the global level, the construction sector is a poor contributor to sustainability. Environmental sustainable is a long term objective. It should be in account of an early stage of a project development.With increased awareness and knowledge of these impacts, efforts are being made to

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avoid these adverse effects and to work towards impact mitigation.

There is a growing consensus that appropriate strategies and actions are needed to make buildings and construction activities more sustainable (BSRIA, 1998; DETR, 1998; CIB, 1998; CRISP, 1998; Barrett et al., 1999; Halliday, 2008). With respect to such significant influence of the construction industry, the sustainable construction approach has a high potential to make a valuable contribution to sustainable development.

In a research carried out by Ofori et.al, (2000). understanding the environmental issues surrounding the extraction of raw materials, the manufacture of construction materials, and their effects in use, is important to ensure sustainability.Teri-Griha (2000) mention that site planning should be done by preserving and protecting landscape during construction, soil conservation and reduce air pollution during construction.

In a paper by Zainul Abidin, 2010 and Ithnin, 2006 pointed out that construction activities had led to many environmental problems such as deforestation, decimation of water catchments, destruction of endangered fauna and flora, soil erosion and landslides. Zainul Abidin (2010) also stressed that an organizations must committed to environmental performance targets that appropriate strategies and actions are needed to make building activities more sustainable.

Shen et. al.(2011) had mentions that various of environmental aspect such as ecological effect, effect on land pollution, effect on air quality, effect on water quality, noise effect, waste generation, influence on public health, environment protection measures in project design, energy savings, protection to landscape and historical sites.

6. Environmental Sustainability at Pre-Construction Stage

Construction activity is known to have a major impact on the environment and require a strategy to protect for next generation. The basic concept of sustainable construction includes: environmental protection, social well-being and economic prosperity. Sustainability is a approach concept which, in addition to the environmental aspect. The awareness on environmental protection due to the depletion of non-renewable resources, global warming and extremity of destruction to ecology and biodiversity impact, this issue is gaining wider attention by the construction industry worldwide.

Sustainable construction starts with planning and design stage. Construction should using sustainable materials which benefits throughout the various stages of a building's life cycle.

Planning stage emphasizes on revising and rearranging construction schedules to reduce the aggregation and hazards. This category has effect on dusts, noises, solid and liquid wastages, ground movement and others. The following environmental impacts have the potential to be generated during the pre-construction of the project life cycle:

Katz A and Baum (2004 in their paper have identified and analysed that the most important stages in construction project enable to construction waste minimize are design issues. A good management at this stages where manager could minimize the waste generation at the construction process. The project participants should make a strategy plan to minimize the construction waste before the construction starts.

Figure 1 shows the sustainability concept to generate the environmental sustainability based on the sustainability in construction within the environmental issues.

Planning stage is the most important part for environmental sustainability integration in construction process. A environmental sustainability could be start form the project onset and are integrated into project phase. Environmental sustainability is a proactive action if implemented in the design and planning phases. Effort made in early project phases are most effective at preventing problems in constructivity.

According to Kadir et al. (2005) the low quality of design deliverable has caused a change in order due to design errors during the planning stage. This may lead to produce waste and due to creating unsustainable to the environment.

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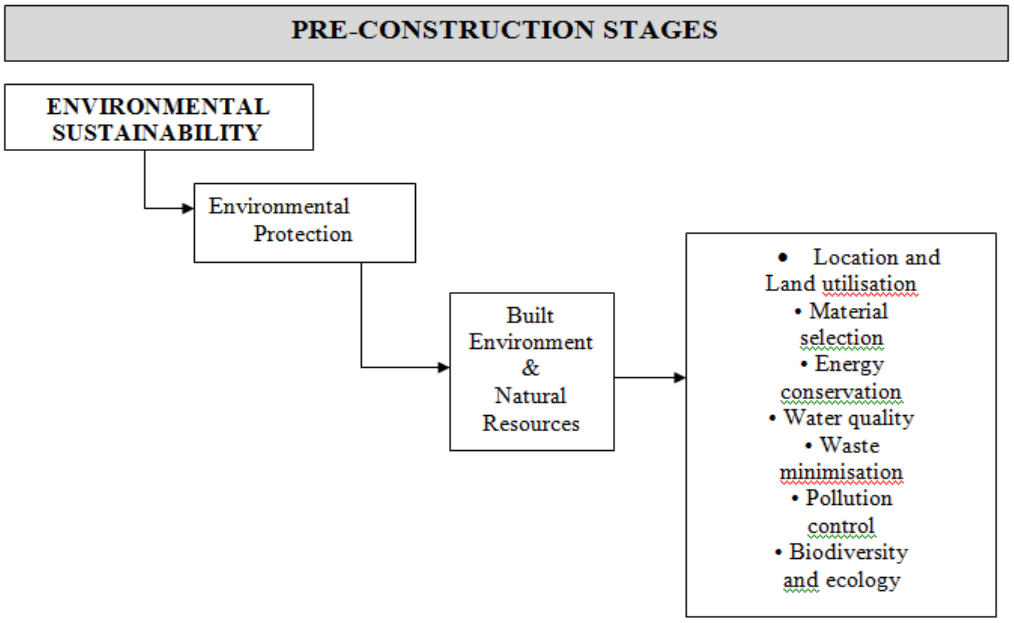

Figure 1: The diagram of sustainability in construction adaptation from Zainul Abidin (2005)

7. Concepts of Environmental Sustainability in Pre-Construction

The main idea of environmental sustainability is to concentrate on environmental conditions to achieve a building product with consideration of environment so that it can minimize the undesirable aspects of these constructions. Buildings must reply to environment from feasibility up to design stage and settling when they are to decrease confronting with nature. Figure 2 shows the environmental sustainability through pre-construction project life cycle which feasibility, planning and design phase

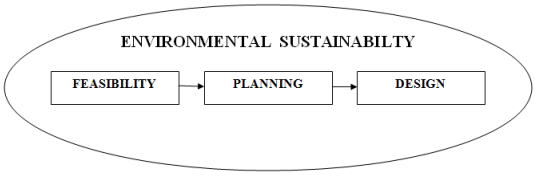

Figure 2: Environmental Sustainability through Pre-construction project life cycle.

The purpose of the research study was to determine the main attributes of sustainability in the field of construction, and make a conceptual environmental sustainability in this field. As conclusion, the model of sustainable building (Figure 3) summarize in four categories that main and essential aims in each one are presented. Generally, features of sustainable building are concerned with three major items in social, economic and environmental groups. Environmental has been highlighted and able to reducing the impact on environment in construction phase. This model generally indicates and proposes features which building should have in order to achieve environmental sustainability.

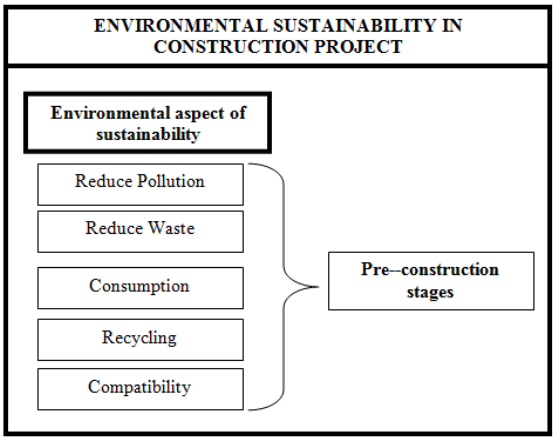

Figure 3: Environmental Sustainability conceptual model.

8. Potential Environmental Impact of the

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Project

8.1. Potential Impact during the Preconstruction Phase

The important issue focused on in study is the environmental issues affect to the construction project. Activities that take place in the pre-construction phase (preparation site works) present several negative effects for environment, nevertheless with a minimum care these effects could be brought to a bare minimum. In this phase effects in the environment could be expected as a result of: Noise from vehicles; Dust emissions, as a result of waste removal; Soil contamination due to accidental leakage of oils from equipment used; Pollution of the road resulting by the traffic of equipment and transporting vehicles. Environmental pollution is the sum of elements that do not want in our environment thus reduce pollution and associated effects from construction activities.

Several environmental impacts identified as potential effects of this project and they have been classified below in phases: Pre construction phase: During this phase environmental impacts are mainly concentrated in the working area and might be a result of preparation works (like removal of already existing waste). These activities might cause a limited local air pollution and also small pollution of the soil.

Most pollution incidents are avoidable. Careful planning can reduce the risk of pollution. Most of the measures needed to prevent pollution cost very little, especially if they are included at the planning stage.

8.2. Development of Environmental Sustainability Mindful Attitudes

8.2.1. The integration of environmental sustainability issues into pre-construction stages: theoretical concept

The environmental assessment is carried out during the preparation of a plan or programme and before its adoption or submission to the legislative procedure.' (European Parliament and the Council, 2001) In other words the environmental consideration should carry out at an early stage. Therefore the building and construction sector has great responsibilities to improve all their activities towards a more sustainable future. Diwat K.S. (2014) pointed out that a construction is sustainable if it meets environmental sustainability (eg. reducing greenhouse emissions, lowering pollutant levels in storm-water and effluent discharge into rivers and oceans).

8.2.2. Awareness of sustainable construction

Environmental sustainability awareness is the first step towards the achievement of sustainability in construction project. Awareness and significance of environmental sustainability has been growing around the world for the last few decades. Ding, (2005); Majdalani et al., (2006) in their research mentions that sustainable construction is now considered as a path for the industry to contribute to achieving sustainable development The built environment is a major component of human activity and a subject of increasing interest for sustainability practice. The environmental impacts contributed by construction activities include climate change, ozone depletion, soil erosion, desertification, acidification, loss of biodiversity, land pollution, water pollution, air pollution, depletion of fisheries, and consumption of resources such as fossil fuels, minerals, and gravel (Hill and Bowen 1997; Kibert 2008; Roodman and Lenssen 1995; Shah 2006). Pollution and hazards caused by construction projects have become serious problem recently. Sources of pollution and hazards form construction sites include dust, harmful gases, noises, solid and liquid wastes and ground movements.

8.2.3. Potential impact under construction phase

During the construction phase there might be additional negative effects in the environment, but with the right management of such effects a real harm is not supposed to be caused to the environment. Below a list of potential effects (impacts) in the environments is presented: Soil degradation Due to working activities soil in the area where the construction shall take place is going to be affected, mainly due to excavations.. In this case the soil with extracts of humus shall be removed. Also equipment engaged in activities might cause light contaminations of soil. This is expected due to leakage of fuels and other liquid form equipment. Another factor that could potentially contribute to soil contamination would be inadequate storage of different waste created during construction phase (construction waste etc).

9. The Environmental Issues

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Environmental issues are a growing concern around the construction industry. More attention is being paid to the adverse environmental impacts of building construction.

9.1. Noise, vibration, dust, and traffic disruptions

The noise, vibration, and dust produced from construction sites are main contribution of environmental pollution that affect the quality of environment. Noise is expected to be present in the construction phase. Noise mainly results from the work of equipment and their traffic as well. Emissions in the air present due to dust emissions and combustion of construction vehicles.

9.2. Generation of waste

Calkins (2009) suggested that a sustainable building materials should produce none or very minimal environmental and human health risks. Charles and Connolly (2005) proposes a systematic approach to the monitoring the wastes should have on each construction site. Poon et al. (2001) mention that the construction waste reduction should be considered at early stage of project.

9.3. Protection of green land

Each and every construction projects should be aware of protecting agriculture lands.

10. A Concept Strategy to Environmental Sustainability in Pre-Construction Phase

10.1. Environmental Sustainability through pre-construction phase

The comprehensive phases of a construction project such as feasibility, design, building or construction , operation and demolition. Through the feasibility and design stage it is important to considered the environmental sustainability. The project brief and as the project proceeds the briefing material is to be clearly explained to the client and approval obtained. This could be integrated with environmental sustainability application up to the project completion.

This phase associated with environmental effects where a construction phase also results with land degradation, creation of waste leftover from construction materials, local air pollution, leakages of polluted waters as a result of certain processes, as well as with requirements toward safety at work, etc. Table 2 summarises environmental issues in the construction industry.

Emissions from construction equipment are the main contributor of environmental impacts from construction processes. Emissions from construction equipment account for the largest share (more than 50%) of the total impacts (Guggemos and Horvath 2006). Throughout the framework, the emission estimation model need to be carry out in supporting the selection of construction methods in the planning phase. Action such conduct the reliability of emission estimation for construction operations and greatly help in operations-level planning in terms of minimizing the environmental impacts.

10.2. Environmental sustainability through design phase.

In the design phase of any building Industry, appropriate material selection is critical for the entire project.

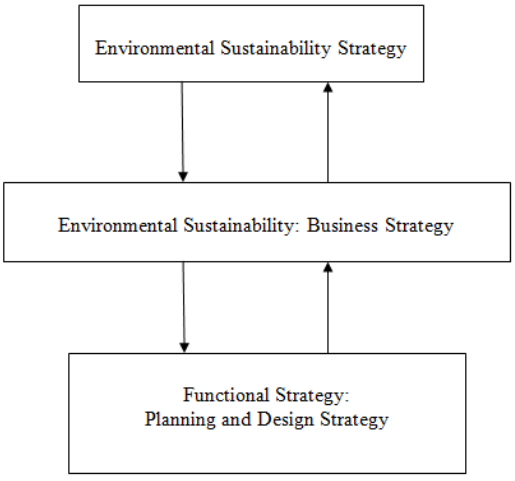

Figure 4. Hierarchy of Environmental Sustainability strategy.

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Environmental Sustainability at pre-construction stages	
Major Concerns: • Environmental (erosion, pollution, species extinction, maintenance of biodiversity, conservation • Pollution control, development of management awareness and more efficient	**Goal/Objectives:** • Ensuring a environmental sustainability level at pre-construction stage • Ensure the environmental sustainability at decision making
Principles: • Environmental Sustainability impact assessment on pre-construction stage • Ensure of effective environmental sustainability at procurement level	**Strategies:** • Pollution and waste reduction • Coordinative and proactive approaches of environmental sustainability • Participatory planning • Reforming construction site policies to discourage environmental destruction • Environmental awareness

Figure 5: A summary of environmental sustainability

Table 2: Environmental Sustainability perspectives of planning phase decisions

Decision Categories at Planning phase	Environment Sustainability
Strategy capacity decisions	• Amount of virgin material use • More efficient use of resources • Reduced pollution
Strategy facility decisions	• Amount of virgin material use • More efficient use of resources • Reduced pollution
Strategic process technology decisions	• Amount of virgin material use • More efficient use of resources • Reduced pollution and wastes • Use of a alternative energy
Stategic supplier relationship decisions	• Amount of virgin material use • More efficient use of resources • Reduced pollution and wastes • Use of a alternative materials
Strategic resource and design decisions	• Environmental sustainability design • Environmental sustainability design usage
Strategic design material resource decisions	• Application Environmental sustainability materials • Training and application of environmental sustainability in project
Strategic design planning decisions	• Environmental sustainability operations • Environmental sustainability productivity • Environmental sustainability transport • Environmental sustainability design assemble • Environmental sustainability logistics
Strategic design service	• Environmental sustainability and eco-design • Environmental sustainability Design of green services
Stategic design organisation	• Establishment of formal unit to be responsible for Environmental sustainability performance

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11. Data Analysis and Discussion of Findings

11.1. Research Question (1): The involvement of personnel in the construction project

Table 1 shows the roles of the respondents for the interview. The respondents were asked to identify, from the list given, the number of construction project that the respondents have been involved in before. Table 1 show the respondents position in the organization and number of construction projects that the respondents have been involved in previously. The ratings are as follows.

From Table 3, most of the respondents have been involved in 5 to 10 construction project in which the respondents were project managers (4), project engineer (5) , Architect 1(1) , Client representative (1) and others (6). These contribute sto 1 out of 41 total respondents (41.5%). A total of 31. 7 % of respondents have been involved in between 1 to 5 construction projects. The rest (2.8%) of the respondents have been involved in between 1 to 5 construction projects. This shows that most of the respondents had multiples experiences in the construction industry.

Table 3: Respondents position and number of construction project involved.

Respondent position	Construction project involved				Total	Percentage (%)
	Never	1-5 projects	5 – 10 projects	10 and more		
Project manager	0	0	4	4		19.5
Project Engineer	0	3	5	2	10	24.4
Architect	0	2	1	2	5	12.2
Client representative	0	2	1	2	5	12.2
Quantity Surveyor	0	1	0	1	2	4.9
Others	0	3	6	2	11	26.8
Total(N=41)	0	11	17	13	41	100.0
Percentage (%)	0	26.8	41.5	31.7	100.0	

11.2. Research Question (2): What is the level of professional knowledge of the environment?

Research question one which sought to know what the professional involving in the construction project know about the environment sustainability in which they conducted in research questions comprises of 6 options A, B, C, D, E. Construction industry key players are the target respondent in this research because of their strategic importance to implement environmental sustainability in a construction project.

From the Table 4 above based on set out levels of decisions, it shows that 64% of the individual have moderate level of awareness of the environment sustainability in which construction project they conducted in while 46.66% is aware of the causes of environment degradation, 61% has a moderate level of how the developer keen within environment green concept. 69.33% agrees that keen with green concept. 66.66% agrees that pollution can affect the health of living things in the environment; 42% believes that an water pollution affected the environment; 28.66% also do know that the component of the environment which is a low level of the knowledge about the environment; 28.66% agrees that toxic can cause ozone layer duplication; 54.66% agrees that all of these are type of pollution could affect the pre-planning stages.

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Table 4: Respondents awareness on environmental issues

	Items	1	2	3	4	5
1	The awareness on environmental issues among construction players in Malaysia is good	-	6.6	64	14.6	8
2	Environmental sustainability aims to reduce pollution, ensure energy efficiency in projects, minimize waste and water consumption and many more benefits	46.66	6.66	9.33	13.33	24
3	Many developers are keen on applying green concept in their project	69.33	61.33	6.66	16	10.66
4	The concern on environmental issues should be at the forefront of any construction projects	66.66	2.66	5.33	24	1.33
5	The environmental problems emanating from construction sector is a major concern	21.33	12.66	24	42	-
6	Many developers are keen on applying green concept in their project	5.33	2.66	12.66	42	37.33
7	Water pollution could affect the environment	42.66	12	10	14.66	20.66
8	Toxic can cause ozone layer depletion	14	28.66	24	19.33	14
9	All these environmental pollution affect the pre-planning stages	-	1.33	8	3	54.66

11.3. Research question (3): Are there environmental related courses assigned to individual in their departments?

Research question (2) was to solicit information on environmental sustainability application to the construction project that they had conducted. From the Table 5, 84% of the respondents who are project managers agree that environmental sustainability is important to the pre-project stage showing a very high level based on the awareness. 72% agree that environmental sustainability is not affected the management, 32% agree to the fact that managers at any level should participle the environmental sustainability at construction site, 63% responded that they have not apply for any environmental awareness, 72% indicated that environmental sustainability is not in their project intention.

Table 5: The research question comprises of five (5) items in yes or no options.

Items	Yes	Percentage	No	Percentage
1	126	84%	24	16%
2	42	28%	108	72%
3	102	68%	48	32%
4	55	37%	995	63%
5	42	28%	108	72%

This could be summary that the individual management on site are sensitized to the environmental issues and problems. In addition also they are aware and participate on environmental issues on the pre-construction stage

12. Conclusion

Today there is an increasing awareness of environmental issues in the construction industry. Environmental Sustainability is a concept that continues to grow in awareness and importance to protect environmental. From the above study it can be concluded that most of the environment pollutants are directly or indirectly cause by human activities. Therefore, what we need to realise is that at this point the issue of pollution and degradation of natural environment have influenced communities to consider environmental matters as vital issues.If the construction industry is to make its environmental sustainability to the efforts to preserve the quality of the environmental for posterity, then consideration should be at early stages of the development process.

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