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Topic

Incorporating Environmental Sustainability in Project Management Practices in Ghana

By

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DECLARATION

I hereby declare that this work is the result of my own original research toward the award of Master of Science Degree in Project Management and that, to the best of my knowledge it contains no material previous published by another person nor material which has been accepted for the award of any other degree of the University, except where duly acknowledgement has been made in the text.

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ABSTRACT

Sustainability concerns in delivering construction projects have come to the forefront of the world, and the gap between project management and sustainability is still been built. It is therefore important for project managers to identify how their organizations can become ecologically sustainable, socially responsible and economically competitive. This is a quantitative study that was conducted in the Kumasi metropolis with an aim of identifying ways of incorporating environmental sustainability into project management practices in Ghana. The primary research was conducted using survey questionnaires. The structured questionnaires were used to obtain data to ascertain the negative impacts of projects on the sustainability of the environment, challenges associated with incorporating environmental sustainability into project management practices and strategies could be adopted to enhance incorporation of environmental sustainability in project management. A total number of fifty questionnaires were administered and forty were retrieved representing a response rate of 80%. Relative Importance Index rankings were the main tool used for analysis. The findings of the research revealed the main impacts of projects on the environment as air pollution, destruction of virgin land and noise pollution. The main challenges associated with the incorporation of environmental sustainability into project management practices are slow government programs, lack of public education, and lack of support from top management. However, the strategies to enhance the incorporation of environmental sustainability in project management; considering environmental sustainability at planning and design stage, effective legislative frame work and creating awareness programs were also ascertained. It was recommended that there should be public education on how environmental sustainability could be incorporated into project management practices.

Keywords: Environment, Environmental sustainability, Project management, Practices, Ghana

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LIST OF ABBREVIATIONS

ASCE	-	AMERICAN ASSOCIATION OF CIVIL ENGINEERS
E S	-	ENVIRONMENTAL SUSTAINABILITY
PM	-	PROJECT MAANAGEMENT
PMI	-	PROJECT MANAGEMENT INSTITUTE
IPMA	-	INTERNATIONAL PROJECT MANAGEMENT ASSOCIATION
PMBOK	-	PROJECT MANAGEMENT BODY OF KNOWLEDGE
APM	-	ASSOCIATION FOR PROJECT MANAGEMENT
CSFs	-	CRITICAL SUCCESS FACTORS
S D	-	SUSTAINABLE DEVELOPMENT
KSAs	-	KNOWLEGDE, SKILLS, ABILITIES
SDIS	-	SUSTAINABLE DEVELOPMENT INDICATORS
CS	-	CORPORATE SUSTAINABILITY
TBL	-	TRIPLE-BOTTOM-LINE
UNEP	-	UNITED NATIONS ENVIRONMENT PROGRAM
EEA	-	EUROPEAN ENVIRONMENT AGENCY
UNDP	-	UNITED NATIONS DEVELOPMENT PROGRAM
GHG	-	GREEN HOUSE GAS
MCI	-	MALAYSIAN CONSTRUCTION INDUSTRY
CIDB	-	CONSTRUCTION INDUSTRY DEVELOPMENT BOARD
GRI	-	GLOBAL REPORTING INITIATIVE
GBI	-	GREEN BUILDING INDEX
ACEM	-	ASSOCIATION OF CONSULTING ENGINEERS MALAYSIA

PAM	-	ASSOCIATION OF MALAYSIAN ARCHITECT
UK	-	UNITED KINGDOM
SSNIT	-	SOCIAL SECURITY AND NATIONAL INSURANCE TRUST
PPM	-	PROFESSIONAL PROJECT MANAGEMENT
PPMP	-	PROCUREMENT PROJECT MANAGEMENT PRACTICES
LEGO®	-	"PLAY WELL"
EMP	-	ENVIRONMENTAL MANAGEMENT PLAN
ICT	-	INFORMATION COMMUNICATION TECHNOLOGY
GT	-	GREEN TECCHNOLOGY
IBS	-	INDUSTRIALIZED BUILDING SYSTEM
GIA	-	GHANA INSTITUTE OF ARCHITECTS
GhIE	-	GHANA INSTITUTE OF ENGINEERS
D1K1	-	FIRST CLASS CONTRACTORS
D2K2	-	SECOND CLASS CONTRACTORS
IBM	-	INTERNATIONAL BUSINESS MACHINES
SPSS	-	STATISTICAL PACKAGE FOR SOCIAL SCIENCES
BSc	-	BACHELOR OF SCIENCE
HND	-	HIGHER NATIONAL DIPLOMA
MSc	-	MASTER OF SCIENCE
RII	-	RELATIVE IMPORTANCE INDEX
WCED	-	WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT

DEFRA - DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS,

KEETHA - MALAYSIAN MINISTRY OF ENERGY

COS - CARBON DIOXIDE

NOx - NITROGEN OXIDES

TRIPLE P - PEOPLE, PLANET, PROFIT

TBL - TRIPLE-BOTTOM-LINE

DEDICATION

This thesis is dedicated to all my family members and especially to the memory of the late

OPANNIN J.Y BADU.

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May the almighty God richly bless you all.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

In most times multinational firms are often tasked by stakeholders to take up environmental and social responsibility. Maintaining ecological sustainability whiles fulfilling this responsibility could become a major social responsibility challenge for businesses (Stern,2006; *The Economist*, 2008; Joseph Des Jardins,2007). It is therefore important for project managers to identify how their organizations can become ecologically sustainable, socially responsible and economically competitive. Most people spend their time indoors, in offices, schools, and homes, and the indoor environment affects human's health, well-being, and performance (Kuo et al. 2008; Di Giulio et al. 2010).

The American Association of Civil Engineers (ASCE), (2006) explain sustainability on general terms to mean, the ability to meet the needs of the present generation without compromising on the ability of the future generation to maintain a similar standard of living with a minimal impact on the environment. Over the years, environmentalist have been stressing the need to promote an ideal society that ensures congenial living environment for its habitat such that man-made and environmental assets if not improved be left in almost equal amount as it was inherited from previous generations. Nonetheless, such an approach sounds more utopian than reality in the construction industry. Zhao (2011) argue that the construction industry not only are they resource intensive, but their activities also have a great deal of impact on the environment that sometimes compromise on the ability to sustain the environment.

Organizations adopt distinct approach in dealing with environmental and social issues and have established innovative technologies in implementing sustainable strategies. It is noted that According to Adjarko, Ayarkwa and Osei-Poku, (2014) Environmental Sustainability (ES) is a dynamic initiative that involves all players within construction industry to be willing to change from the conventional practice to the adoption of more eco-friendly construction practices. Pope et al., (2004) added that economic, social and environmental issues are becoming more complex in nature and therefore needs innovative approach to manage them. The Project Management Institute (IPM) (2013) revealed that indeed there has been increasing interest in using innovative ways to manage projects which as well satisfy professionals who are already in this field. Bocchini et al., (2013) posits that project management has been a platform that nest positive influence on the integration of sustainability dimensions in projects. Nonetheless incorporating environmental and social dimensions into programs and projects have been considered as a strenuous task (Sanchez, 2015).

In project management, the attention is clearly moving from immediate project goals or the traditional management of project to broader project benefits (Kivilä et al., 2017), and dimensions of value that are more versatile (Martinsuo and Killen,2014). Sustainability and project management issues have been a battle where numerous researches have been conducted. However, not much effort has been made in linking the two together. Some initiative taking, only address the themes where sustainability practices in organizations are assessed on broader based without addressing specific organizational functions. It is important to remember the gap in the management level of organizations with regard to the incorporation of sustainability aspects in organizational processes, arguing the need for the incorporation of these concepts in project management function (Rabechini Junior and Carvalho, 2011).Given this background, this study

seeks to identify the ways of incorporating environmental sustainability into project management practices in Ghana.

1.2 Problem Statement

Sustainability concerns in delivering construction projects have come to the forefront of world, and the gap between project management and sustainability is still been built (Carvalho and Rabechini, 2017). Nevertheless, it is still challenging in project management field (Martens and Carvalho, 2017). However, most of the adopted green solutions, especially in developing countries, remain to be the traditional command-and-control or "end of the pipe" solutions where a firm tries to eliminate or reduce negative environmental impacts, after they are created, rather than adopting a proactive approach to reduce the sources of waste or pollution (Anbumozhi and Kanda,2005; Waltonetal., 1998).

There are several reference guides in the project management area like the Guide of the Project Management Body of Knowledge (PMBOK) given by the Project Management Institute (PMI, 2013), which is structured into ten areas of knowledge, yet doesn't identify potential environmental interest as a factor of influence (Silvius and Schipper, 2014; Martens and Carvalho, 2016). However the association for Project Management (APM) past Chairman Tom Taylor recognizes that 'the planet earth is in a perilous position with a range of fundamental sustainability threats' and 'Project and Programme Managers are significantly placed to make contributions to Sustainable Management practices' (Association for Project Management 2006). A context-specific critical success factors (CSFs) need to be developed to assist project managers, as plays a key role in enabling and smoothing the process of integrating sustainability into project management practice (Martens and Carvalho,2017).Given this background, this

study seeks to identify ways incorporating environmental sustainability in project management in Ghana.

1.3 Research Questions

Questions pertaining to the study were asked below:

1. What are the negative effects of projects on the sustainability of the environment?
2. What are the challenges associated with incorporating environmental sustainability into project management practices in Ghana?
3. What effective strategies could be adopted to enhance incorporation of environmental sustainability in project management?

1.4 Aim and Objectives

1.4.1 Aim

The aim of the study was to identify ways of incorporating environmental sustainability in project management practices in Ghana.

1.4.2 Objectives

In achieving the stated aim, the objectives below were adopted:

1. To identify the negative effects of projects on environmental sustainability in Ghana;
2. To identify the challenges associated with incorporating environmental sustainability in project management in Ghana; and
3. To identify effective strategies to enhance the incorporation of environmental sustainability in project management in Ghana.

1.5 Research Scope

Contextually, the study focuses on project managers, architects, engineers, quantity surveyors and other project team members in Kumasi the Ashanti region of Ghana and tailored to investigate ways of incorporating environmental sustainability in project management in Ghana. Geographically, the study targeted project management professionals in the Ashanti region precisely the Kumasi Metropolis. This Metropolis was decided upon because more firms are located there and many project management professionals seek to find green pastures in these city because of the increasing demand for project executions like housing facilities and other projects and the other economic benefits they enjoy.

1.6 Methodology

The study employed a quantitative research method. A structured questionnaire survey was designed to collect primary data from project managers, architects, civil engineers, and quantity surveyors of D1K1 and D2K2 construction firms in the Kumasi Metropolis, purposive sampling technique was used for this research. The researcher adopted this technique so as to directly approach project management professionals who would readily provide the primary data required. A time frame not exceeding two weeks was allowed for collecting the primary data whiles secondary data from both publish and unpublished sources were collected over the entire period of the study. Descriptive statistics was used in analyzing the quantitative data which was collected from the questionnaire survey.

1.7 Significance of the Study

Practically, the results of the study will provide relevant information on ways of incorporating environmental sustainability in project management, which in effect will help project managers to deliver sustainable projects for the benefit of Ghana and the world at large. More importantly, knowledge is dispersed and context specific, therefore, ways of incorporating environmental sustainability in project management practices constitute valuable source of knowledge. Thus, the study would contribute to available literature in the field of project management.

1.8 Thesis Structure

This research employed five different chapters; **Chapter one** dealt with general introduction: background, statement of problem, aim, objectives, scope, methodology and organizations of study. **Chapter two** concentrated on various literatures relating to environmental sustainability practices, challenges involved and most effective strategies available in achieving the environmental safety in managing projects. **Chapter three** was in research methodology; sampling frame (target group), instrumentation design (questionnaire), administration and tools for statistical Analysis. **Chapter four** covered data analysis and discussion of outcome. The strategies for environmental sustainability in project management utilization are thus developed from the data analysis and discussions. **Chapter five** concluded the overall research and suggested recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

The background of the study, aim and objectives as well as the scope of the study was reviewed in the preceding chapter. This chapter dealt with reviewing the literature that is relevant to the subject of sustaining the environment in which projects are developed in project management practices in Ghana. The chapter began by giving the overview and significance of environmental sustainability, the practices, challenges, and the effective strategies available to enhance environmental free projects in Ghana.

2.2 SUSTAINABILITY

The concept of sustainability is explained by Gladwin et al. (1995) as an involving process that seeks to create and develop community's vision that respect and make efficient use of natural resources, making effort to ensure that the incoming generation also have a high degree of economic security and can attain democracy and popular participation while still preserving their ecosystem.

To be able to address the issue of sustainability it is relevant to understand the meaning of Sustainable Development (SD). Sustainable development as define by the popular Brundtland report is the development that meet the needs of the current generation without compromising on the future generation to meet their own needs (WCED, 1987). Sustainable development hinges on three different dimensions which include; the environment, social and economic dimensions. These dimensions are often caption as the Triple-Bottom Line.

Since the Earth Summit held in 1992, concepts such as "sustainable development" and "ecological modernization" have commonly seen in policy documents emphasizing the need to integrate economic, social and environmental concerns (Gibbset al., 2005).

Moreover, some authors like Gimenee et al. (2012) and Kleindorfer et al. (2005) explain sustainability to include environmental management and a close loop supply chain as well as a broad perspective of the Triple-bottom Line. According to Gordon and Glenn (1998) the United Nations recognized sustainability as one most important challenge in contemporary time.

Concern of sustainability can be dated back as far as the 17th century. The Saxon mining officer Carlowitz Von published the first report about sustainable yield forestry in 1713. Carlowitz suggested in his report that trees should be grow back as many as its logged and used the term 'sustainability' in this context (Castillo, 2009). Zhang et al., (2016) revealed that the quest for economic growth in the developing world has led to increase demand for construction projects. Chang et al (2016) added that this quest for economic growth has overloaded sustainability concerns.

According to Abidin and Pasquire (2007) project managers in the developing world are lagging in adopting sustainable concept in project management. Ghoddosi and Hossiene (2012) attribute this to the fact that project managers in the developing world do not possess the required KSAs that will enable them to use resources efficiently, beside less developed countries only focus on professionals with technical KSAs when recruiting project managers (ahsan et. Al., 2013). Schipper (2016) on the other hand indicate that the Project Management Institute emphasis vehemently on the need for project managers to embrace sustainability in managing project as is their professional responsibility.

Carlowitz Von's concept of sustainability back then was on timber shortfalls for the Saxon mines and maybe simply understood as economic driven. Hockerts and Dyllick (2002) posit that despitethis early concern about sustainability, Carson book titled "Silent Spring" in 1962 is often considered as the launching of contemporary concern on sustainable issues and the judicious use of natural resources.

Sustainability is concern about achieving balance among the three dimensions that is environmental, social and economic (Schipper and Silvius, 2014). This therefore explains that the Triple-bottom line captures the essence of sustainability (Savitz, 2006).

The Triple Bottom Line is used as a basis for assessing, communicating and reporting the impact of human actions on the natural environment. Adams and Frost (2008) indicate that several sustainable development indicators mostly take reference from the triple-bottom line. According to Thomson et al. (2011) sustainability is perceive to be the necessary ingredients needed to understand the environmental, social and economic consequence of project and their support system such as designing, construction, operating, maintenance and eventual disposal of projects. It is relevant to properly link environmental, social and economic dimensions of sustainability in other to create a rational use of resources to some of these resources for the future generation (Kleindorfer et al., 2005; Gimenez et al., 2012).

It is noted that sustainability and sustainable development are distinct, sustainability is the ability to self-sustain itself and the remaining whiles Sustainable development is the ability of a country to grow economically and remain in that state over time (Mendonca and Araujo,2009). Hence SD is often related to public policies while sustainability is the other side which emphases on promoting action by the private sector. These actions aided by business organizations are

referred to as ‘Corporate Sustainability’ (CM). Ebner and Baumgartner (2010 p.77) affirm that when private organizations adopt sustainability it called corporate sustainability and it also hinges on three pillars that is social, environmental economic just like SD does.

Pope et al., (2004) opine that the challenges of the dimensions of sustainable development have become complex forcing organizations to be innovative in managing them.

It is therefore relevant to link sustainability to project management as it is a broader accepted concept of SD given by the World Commission for Environment and Development. Moreover, a well-accepted concept of SD which is widely known is the one based on economic, environmental and social factors (Labuschegne et al 2005; Talbot and Venkataraman, 2011; Gimenz et al., 2012; caevalho and Rabecchini, 2011).

2.2.1 The three Dimensions of Sustainability

It has already been established that any workable sustainable approach must be built on the three dimensions of sustainable development. However, these critical aspects of integrating the dimensions are often neglected by project managers as indicated by Singh et al2012; Silvius et al., 2013). Dvir and Shenhar (2007) argue that projects managers or private investors are more often only interested in the economic dimension since it compensate and reward investors capital, however effort must be made to include the environmental and social dimensions too since they are very crucial in areas such as project efficiency, effective use of resources, renewable energy and employment of clean technology, reduction in consumption of fossil fuel, improve purchase and many more. Carvalho and Rabechini, (2011) added that when project managers incorporate sustainability into project, it enhance in the production of goods and services that satisfy stakeholders expectations.

2.2.2 Economic Sustainability

Economic sustainability is explained as the system of production that satisfies present consumption without compromising on the consumption level of future generation. The kind of sustainability economic sustainability seeks to achieve is 'Sustainability' of economic system itself. The evolution of economic sustainability can be dated back to 1939 by Hicks in his book *Value and Capital;* in this second edition of this book in 1946 Hicks defined economic sustainability to mean 'income' that is the amount one can consume during a period of time and still well off at the end of the period. '

2.2.3 Social Sustainability

Generally there is no one accepted definition for the social dimension of sustainability due it broadness. However what is considered social depends on the context or the theoretical framework it is being used. It is important to understand that the social dimension of sustainability is distinct from environmental dimension. The term social here refer to both individuals and collective levels thus, is a clear reflection of our perception and interpretation of objective social conditions. Empacher (2002) opine that the social phenomenon themselves are essentially immaterial and therefore difficult to gasp and analyze based on a particular quantitative method. Similarly Baker (2006) posits that social sustainability in itself is an open contested concept.

In the most generic sense Social Sustainability refers to social organization whose sole aim is to elevate poverty. However, in a more fundamental sense, social sustainability demonstrates the nexus that exist between social condition such as poverty and environmental decay (Ruttan, 1991). Social sustainability is neither absolute nor constant it must therefore be considered as a

dynamic concept which can change with time (Colleagues and Dempsey, 2011). Moreover, Griebler and Litting (2005) argue that social sustainability must be guided by analytical concept that seeks to establish relationship between society and nature. The social dimension of sustainability together with the economic dimension is considered as the pillars of sustainable development. This shows that the social dimension of SD is very relevant yet it has not been well integrated by organizations (Dominguez-Gomez, 2016; Klotz and Vasquez, 2013).

Recently, a multi-criteria deterministic approached was proposed to be used in assessing social sustainability in infrastructure project 9Sierra et al., 2017). This approach is further structured into three processes that is method that determines a short term social improvement index, a long term social improvement index and a multi objective for prioritizing public infrastructure investment alternative. The short term index is use to determine an infrastructure contribution in the present. The short term looks at the social impact of an infrastructure design, planning and construction up to a period of three years. On the other hand the long term, looks at the distribution of benefits across zones with social needs, it therefore considers the social impacts on the type of tenure used and it conservation of infrastructure. Once the social improvement has been determine then thy can be prioritize base on their contribution.

2.2.4 Environmental Sustainability

According to Sadorsky (2013) rapid urbanization in the developing world has greatly contributed to over-consumption of energy. This phenomenon continues to stretch such nations beyond its limit and hence nations are facing the challenge of efficiently developing infrastructure and housing to meet the growing demands of the population I an ecological responsible manner.

According *to,* Uzzell et al. (2002) environmental sustainability is defined as the protection of natural wealth, control of the consumption of nonrenewable resources, control of the emission of pollution, maintenance of biodiversity, and preservation of flora and fauna and the health of the population.

Environmental dimension of SD evolved in management theory since the 1990s. Hart (1995) presented a report based on a Natural resource base view including product stewardship, pollution prevention and sustainable development strategies. Hart (1995) reveal that management theory has neglected constrains imposed by the environment and similarly is happening in applying sustainable concept by project managements.

Nonetheless as human population continue to grow, materials consumption also increases which in terns expand the levels of production technology. There has been continue concern about loss of biodiversity, pollution of fresh water, global warming, over fishing, urban air pollution, extreme weather conditions and environmental noise.

Many countries in the developing world depend extremely on the ecosystem and it services for survival. Their extreme dependent on the ecosystem makes it somehow difficult to establish long term values to explicitly preserve the environment. The UNEP (2006) reported that poverty is on the rise in some African countries which has resulted in decrease in life expectancy and deterioration of the environment.

Construction firms are incorporating Environmental Sustainability (ES) in their project in other to satisfy client needs and meet stakeholders' expectations. Moreover government policies also demands that construction firms integrate ES in their projects. Again, market competition also forces most construction firms to incorporate ES into projects to improve the overall

performance of the firm in other not to lose out. Sabnis (2015) opine that it is important for construction firms to incorporate ES into their project because activities of the construction industry have been threaten community health and safety due to excessive waste generation, uncontrolled emissions and continues discharges.

The main goal of ES therefore, is to reduce the impact construction activities have on the environment in other to achieve sustainability in the environment. Qi et al., (2010) posits that because of institutional pressure to meet all environmental requirements specified, firms are now being forced to adopt ES in their project.

Recently the Malaysian government in the wake of the relevance of ES in construction projects has initiated the National Corporate Green House Gas (GHG) reporting programme which is caption as 'Mycarbon'. Yusof and Waziri, (2016) indicate that the initiation was to fulfill the pledge made at the 2009 United Nations summiton climate change in Copenhagen. The aim of the summit was to reduce GHG emissions. The decision took at the summit lead to the prioritization of environmental sustainability in the construction industry in Malaysian. Furthermore, sustainability awareness in Malaysia prompted the inauguration of Business Sustainability Progrmme. This programme required all public companies in Malaysia to compulsory incorporate required sustainable criteria in their operations.

Green, Tom and Clark (2015) argue that even though it is relevant to incorporate ES in construction firms, it also important for firms to be innovative in satisfying clients' needs and this will intern enhance their competitive advantage.

Concern for the environment will determine whether a particular construction firm will adopt ES or not. For this reason concern for the environment ultimately becomes a political issue that

follows legislations. These legislations may place a heavy burden on construction firms and businesses. This is because environmental damages require huge compensation payments or huge insurance premiums. In view of this McEIdowney and McEIdowney (1996) opine that abiding by ES legislation is an incentive to developers and companies especially where the cost of eliminating or preventing the nuisance in borne by the polluter. The main concern of ES is to save the planets valuable systems because without them man cannot live on earth.

Nixon posits that on the academic field, some university are making effort in introducing sustainability into academic dialogue and in even this the central point of the dialogues is concern for the environment. Son et al., (2011) reveal that due to the increasing concern on environmental challenges, contractors are now aware of sustainable concept to some extent. However, the major problem is the technical know-how to apply this concept in the actual construction project delivery.

Environmental deterioration post a great risk and opportunities for business organization. For instance Rose, (2008) reported that Marks and Spencer took the opportunity of the challenges of the environment to draft a five-year plan to reduce greenhouse gas (GHG) emissions and Google based on this to install a solar power facility its Headquarters in the U.S.

Primmentel et al., (1994) opine that implementing ES is very crucial in attaining a congenial living environment. He further indicated that we all must learn how to effectively manage resources, by reducing waste and pollution, economical use of energy, efficient use of materials and resources that are not renewable and instance where there is damage, effort must be made to repair it as soon as possible.

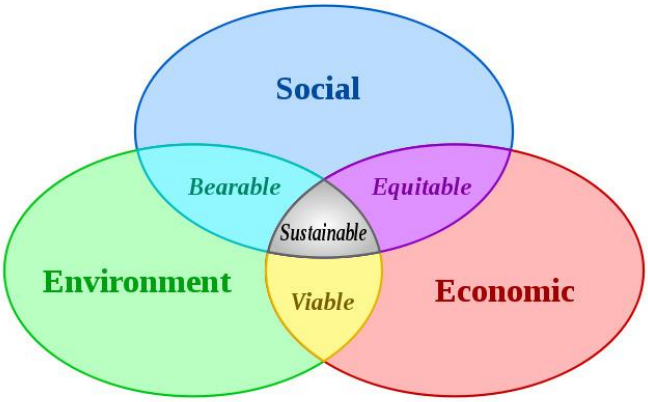

Figure 2.1: The Triple-P concept of sustainability

Source: (Elkington, 1997).

2.3. MODELS OF SUSTAINABILITY

Sustainability discussion have looked at the pillars of sustainability in three main arrangements, this school of thoughts have resulted in creation of models as follows:

2.3.1 Three-legged Stool Model

In the inception of Sustainability discussion, this has been used to show the communal three facets of sustainability: economic, environmental, and social / cultural. The 3-legged stool figure reinforces the three dimensions as shown in Figure 2.1 below, that are crucial for us to enjoy a high quality of life— and shows that society is unbalanced if one of them is feeble. The drawback of this analogy is that the economic, environmental, and social dimensions are looked at as separate and equal.

Figure 2.2: The Three (3) Legged Model of Sustainability

Source: World Conservation Union (IUCN, 2006)

2.4 DRIVERS OF SUSTAINABLE DESIGN AND CONSTRUCTION

Grierson (2009) said taking building designs for granted in our current generation potentially extends a very negative legacy for future generations. Making use of sustainable design principles allows for design to be discussed at every phase of the process which will champion a sustainable design outcome, resulting to healthy and safe environment and occupants comfort, not compromising the end product. But Ofori (2012) noted that stakeholders of the building industry are the main drivers for sustainability in the construction industry.

2.4.1 Innovative Drive

In the Article 13 report of the Commission for Environmental Cooperation, CEC, (2008), it stated that in driving for sustainable design building, should there be continuous innovation in

designing buildings and their orientation in the environment, thus the designing, positioning and construction procedure implemented, positivity in way of life can be achieved. The diving force of Information Communication Technology, ICT, in every aspect of life has not only led to invention of machineries to aid easy, fast and safe undertaking of construction works.

ICT has also innovatively help create software that help assess a building performance and impact on environment right at the design stage. ICT tools qualitatively designed to help stakeholders of the construction industry to evaluate building performance, rating from the environment, social, economic, to health, defined various buildings and adapting to upgrading system of extension and evaluation; aim at booting sustainable building (Roth et al., 2015). A common one is the Multi Criteria Voluntary Sustainability Evaluation (MCVSE) system designed in 1990. Availability of several ICT tools aiding various disciplines in the construction industry are AutoCAD for architects, StruCAD for structural engineers in analysing building designs, Hevacomp for heating, ventilation and air-conditioning building design analysis, etc. (Graham, 2005).

Ghana has not been left out on the Earth Summit's (1990) drive for sustainable environment, setting the Ghana Green Building Council (GHGBC) to ensure sustainability of the environment. The intended goal for GHGBC is to drive the Ghanaian construction industry towards sustainability through precautious planning and designing, construction, operation and maintenance (GBC Official Launch Handbook, 2011).

Stating further that the aim for GHGBC is to improve the general health requirement of the environment through minimization of greenhouse effects on the nation.

Sustainable building measurement tool was first developed by Building Research Establishment Environmental Assessment Method, BREEAM, prior to the 1990's which assess and evaluates building performance (Graham, 2005) considering the building design, purpose, construction method, without compromising comfort and safety of occupants and the environment (Larsson, 1999). GHGBC developed a Building Rating System called the GS GH-v1 Tool. The building rating tool assist designers, specifically architects, and contractors in the design and construction disciplines towards sustainable design building (GBC Official Launch Handbook, 2011). The BREEAM (1990) has serve a benchmark in assessing the sustainability of any building, on the fact that building designs were too robust and redundancy focused acting as a barrier against safety and alteration, inspired interest of incorporating sustainable measures in building designs.

The measurement tool was first tested with a group of developers limiting it to office buildings only, and recorded a 25 percent client interest which led to gradual extension of the performance tool to all other buildings including homes and recreation centres and further upgrade of the tool (BREEAM 1990). Graham (2005), noted the existence several comprehensively innovated upgrades of sustainable design building measurement tools. Example is the Envest which designers can use to determine the impact of all elements of a building design on the environment to guide designers to come up with sustainable building designs. Also, is the Integrated Data Model (IDM), IES Virtual Environmental software guiding the design team to design buildings analysing the performance life cycle of buildings used in Atkins corporation (Graham, 2005).

The objective drive for the innovative ICT Tools thus the Building Rating/ Assessment Tools is to help the various disciplines of the building industry (designers, planners, developers, contractors, facility managers, etc.) to analyse building performance and it impact on the

environment during the design and planning stage to derive substantial sustainable viewpoint for the proposed activity (Daniotti and Lupica Spagnolo, 2007). Effectual application of sustainable building principles will guide towards economically sustainable life cycle of the building.

2.4.2 Social Integration Drive

The dwindling effect of greenhouse emission and rampant destruction to the environment such as pollution, deforestation, etc.; has caused leaders around the world to implement proactive measures to help rebuild, protect and maintain the natural environment from further deterioration (Asamoah and Decardi-Nelson, 2014). Quest of government towards protection and management of the environment by creating a balance between economic and environmental exploit, surfaced with alarms raised altruist and environmentalist on the current dilapidated environment citing the tendency of the country suffering scarcity in near time which will the nation having to depend foreign aids for survival.

Ghana as a developing country is very much affected by the very less practice of sustainability, which has most projects undertaken with less consideration on sustainability, is grazing away all her unpriceable resources, leaving a great worry about future generations' survival.

The diminishing rate of the environment has urged for the immediate and effective sustainable building design measures and their implementation method, with a starting progress noted in recent infrastructural projects by government and associated agencies (Ofori, 2012).

2.4.3 Professional Knowledge and Training

Afriyie et al. (2016), stated that the aim of the Ghana Institute of Architects is to motivate its members to create/develop innovative designs and provide supervision to ensure exact

buildability by contractors, considering time to make available projects. Noting the fact that designers' (architects) play a major role in designing infrastructure and the drive for sustainable design building can easy be substantiated through them.

Not undermining the substantial impact of the construction industry to the environment, quest for implementing effective positive practices in the industry curbing all odds drastically (Ebolon and Rwelamila, 2001). Hemmati (2002), noted that the beneficial growth of forums for professionals of the industry which begun in the early 1990's and has since taken turns, educating the professionals on environmental sustainability and it benefits to sustainable development of a nation. Example cited is the UNED Forum, which its vital aim is imploring professionals to adopt sustainable practices among during their discharge of duty in the environment; through collaborative teaching and understanding and upgrading decision making.

Ghana in recent times has enhance Her understanding on sustainable construction impact and it benefit to the environment and human. Hence taken educative means to groom professionals into the industry with in-depth knowledge and understanding to ensure proliferation in all aspect of the construction industry (Ofori, 2012). Citing an example of these educative measures taken is the establishment of the Construction Industry Development Institute (CIDI) at the Kwame Nkrumah university of Science and Technology in Kumasi-Ghana (Ofori, 2012). The prime aim for this set-up as stated above is to ensure artifice in the built environment leadership style which seek to contribute towards the earnest development of the industry. In terms of knowledge and understanding and improving it method of delivery in the country and beyond.

The Ghana Construction Industry Development Agenda (CIDA), sets to achieve it objectives of supporting the construction industry growth through scaling and development programs, which focus on:

1. Insuring completion proactively/or as scheduled.
2. Developing positive upgrading mind-set towards the industry growth.
3. Performing duty adherent to (contract) agreement (Ofori, 2012).

2.4.4 Adaption to Dynamism and Categorical Imperative

Existence of sustainable building principles and policies cannot prove sustainability in the building industry as innovation must prioritise understanding of implementers to use tools extensively to aid their applications (Foxon et al., 2004). The building industry can be laud to have, in recent times, taken intuitive turn in it practice to achieve sustainable end built, yet the dominance of the traditional method of construction still applies (Zhou and Lowe, 2003), drawing in voice of government encouraging implementation of set policies to the built environment.

A research conducted by Halme et al. (2005) recorded not any barrier posed by energy-efficiency rather uprising issues from actions and inactions of planners, designers, policymakers of sustainability showing less interest on efficient energy management. Energy stands a major challenge of subject to environmental sustainability.

Energy efficiency relays vivacious apprehensible impact on sustainable environment hence requiring energy facilitators and service engineers guide on-board towards sustainability of the built environment.

2.5 PROJECT MANAGEMENT

Project management has been with us since the creation of humankind on earth. This is because projects are not new: monuments surviving from the earliest civilizations testify to the incredible achievements of our forebears and still evoke our wonder and admiration. The evolution of the professional Project management practice had its beginnings in construction, defense and engineering organizations (Morris, 1994).

Project management, as a term, first appears in 1953, arising in the US defense aerospace sector (Johnson, 2002).

Project management is "the means by which the work of the resources assigned to the temporary organization is planned, managed and controlled to deliver the beneficial change" (Turner, 2014: 29).

PM system promises to deliver 'one-off' undertakings 'on time, to budget, within scope' (Morris, 1997), through the planning and control of variables including resources, cost, productivity, schedule, risk, and quality. Project management includes "planning, monitoring, delegating and controlling all aspects of a project in order to achieve the project objectives within the expected performance targets for time, quality, scope, cost, benefits and risks". (Office of Government Commerce, 2009).

According to Morris et al., (2006) the Association for Project Management (APM) in the UK had a similar idea of that of the PMI, however they criticize the PMI's model of being too narrow. Based on this, the APM created a broader document that encompasses matters such as objectives, environment, strategy, people, technology, businesses and commercial issues. Project management is the disciplined application of knowledge, skills, tools and techniques to project

activities to meet the project requirements (Project Management Institute, 2013; Turner & Müller, 2005).

According to Morris et al., (2012) to effectively and efficiently manage projects, the Project Management Institute (IPM) was established in 1969. Another association was established to perform the same management function the association was International Management System Association which was properly caption as 'INTERNET'. In 1972 the name of the association was change to International Project Management Association (IPMA). A number of project management associations also developed in Europe around this same time. Furthermore, a middle management perspective approach was given to Project Management (PM). The central focus was accomplishing the targeted goals of the project and identifying the tools and techniques that will aid in accomplishing these goals (Morris, 2012). The author again noted that it was rarely the successful accomplishment of the project per se, which is after all what really matters. Worse, the performance of projects, already too often bad, was now beginning to deteriorate sharply.

2.5.1 Definition of a Project

The Guide to the Project Management Body of Knowledge defines a project as a temporary endeavor undertaken to create a unique product, service, or result (Project Management Institute, 2008). Also Kerzner define project as any sequence activities and task that have an objective to be completed within a well establish specifications, which have a define start and ending date, with a limited fund, capable of consuming money, using people and equipment and are multifunctional. In this context, projects are considered as temporary organizations (Lundin and Söderholm, 1995; Turner and Müller, 2003), where Silvius et al., also postulate that these temporary organizations most often across boundaries and structures aim at realizing a define

deliverables which is logically linked to organizational goals and within a specified resource budget.

2.5.2 Project Management Body of Knowledge Areas (PMBOK)

The Project Management Body of Knowledge (PMBOK, 2008). guide defines nine knowledge areas in project management encompassing all the processes used in a project from initiation to closing. According to Cook, (1977) the main idea behind the development of the PMBOK was to set a certification for competence if project management was to be considered professional. The initial PMI PMBOK in 1983 had six (6) knowledge areas which has currently be expanded to nine(9) knowledge areas with five(5) process groups. The five process groups are as follows:

- initiating the project,
- planning the project,
- executing the project,
- monitoring the project to see if the project is being carried out as planned and controlling the project to meet expectations and;
- the last activity to be carried out is closing the project.

The nine Knowledge are also as follows:

1. Project Integration Management
2. Project Scope Management
3. Project Schedule management
4. Project Cost Management
5. Project quality Management
6. Project Procurement Management

7. Project Human Resource Management
8. Project Risk Management
9. Project Communication Management

Rabechini and Carvalho (2015) suggest that the knowledge areas and the process group should aid in addressing sustainable issues in the Triple Bottom Line (TBL).Particularly relevant is introducing sustainability in the PM areas of scope, human resource, stakeholder, communication (soft side), procurement and risk.

Sustainability in project management can be viewed from different angles. According to Rabechini and Carvalho (2015) PM sustainability can either be viewed from internal perspective or from external perspective. The author noted that the internal perspective is link to the project life cycle, the knowledge areas and the process groups whiles the external perspective is linked to social and environmental impact of the project in a broader perspective.

Marcelino-Sádaba et al. (2015) observe that "projects are the ideal instrument for change management" and that "the necessary change that we require towards sustainability will be boosted by applying the project management discipline to sustainability." (Marcelino-Sadaba et al., 2015). Projects and their management are recognized as "a way to sustainability" (Marcelino-Sadaba et al., 2015; Huemann and Silvius, 2017). Doubtlessly, sustainability should be introduced at organization level and yet it is still an under-developed research area (Boons and Lüdeke-Freund, 2013).

2.6 PROJECT MANAGEMENT PRACTICES IN GHANA

The Professional Project Management Concept was introduced in Ghana in the late 1980s when the framework was first introduced to the Social Security and National Insurance Trust (SSNIT),

(Ahadzie and Amoah-Mensah, 2010). Previously, SSNIT largely relied on traditional the management practices in the implementation of its housing projects, this led to time and cost over-runs; estimated to be more than 100% of the actual cost and time. Government of Ghana and the general public, whose contribution were being used for such investment became alarmed and lost confidence in SSNIT as reliable housing providers (Ofori, 1989; Ahadzie and Amoah-Mensah, 2010). It was during this difficult period that made SSNIT appointed their first Professional Project Manager involving the construction of 1,637 single storey- housing in the Sakemono area, Greater Accra Region of Ghana (*Ibid*).

Professional Project Management (PPM) practice is still a critical issue in many organizations operating in Ghana. Although, the expansive role of the private sector in recent time in this agenda, infrastructure supply has not improved any better, and there is no clue that project management practice of these projects has received any knowledge-based improvement (Ahadzie &Amoah-Mensah, 2010). More so, it remain very critical in all developing countries due to the advancement of technology, the increasing complexity of projects and the scarcity of human capital (Thomas & Winter, 2006), which is compounded with highly competitive market in the CI (*c.f* Sutherland & Maxwell, 2000).

However, Goodwin (1993). indicated that effective project management decision rank as a single most influential contributor to achieving improved performance in the construction industry. It is therefore important for this research to be undertaken to find the empirical understanding of the status of PPM practices in the Ghanaian construction industry to improve on the best practices and delivery of projects. It is therefore; not surprising Project Management Institute of Zimbabwe stated that *"failure to recognize the value of project management as being at the core*

of development in our civilized society is like depriving ourselves of mastering a critical life skill" (Thomas and Winter, 2006). Accordingly, PPMP presents a mechanism for developing countries like Ghana to compete effectively and efficiently with their developed counterparts in areas such as engineering, finance, aerospace and construction. However, it has not been fully implemented because of the extent that (PM) practice in developing and emerging economies is complicated (*c.f* Andersen *et al.,* 2002).

2.7 ENVIRONMENTAL SUSTAINABILITY AND PROJECT MANAGEMENT

Project management provides an opportunity in this respect. It facilitates continuous learning in organizations since it includes specific processes for knowledge management, making it easier to accumulate knowledge generated by experience. According to Bond et al. (2012), learning from experience gained from assessing sustainability can be framed in two ways: learning by doing and learning from mistakes. Environmental sustainability is considered one of the most relevant contemporary challenges faced by firms (Dangelico & Pujari, 2010).This importance and pressure to adopt environmental sustainability has been evidenced since 1972 with the United Nations conference for the environment that occurred in Stockholm, and the global problems of environmental sustainability have been part of the political agendas of most countries (Dangelico, 2015).

Moreover, energy production can also potentially have significant environmental impacts, such as significant increases in CO2 emissions, water pollution, soil contamination, deforestation, and loss of biodiversity (World Bank, 2013).With respect to environmental issues, some research studies have recommended the application of eco design methods (Bovea & Pérez-Belis, 2012;

Brones & Carvalho, 2015) and project life cycle analysis (Silvius et al., 2012) as support for incorporating environmental sustainability into project management decisions.

With a concern for sustainability, environmental analyses can also guide (PPM) (Sánchez, 2015).Given the integration of product portfolio and environmental sustainability, the work of Brook & Pagnanelli (2014) suggests that environmental decision-making in portfolio management should consider aspects such as: (i) strategic alignment: projects must be aligned with the company's sustainability agenda; (ii) brand: projects should strengthen the firm's position on sustainability; (iii) CO2 emissions/biomaterials: projects should contribute to zero emission levels, and be based on biomaterials; (iv) strengthening technology capabilities: improving the company's technological capabilities in relation to sustainability. Dobrovolskienė & Tamošiūnienė (2016) also emphasize that it is relevant to adopt specific sustainability criteria for choosing and allocating resources within the project management.

Silvius et al. (2012) and Khalili-Damghani & Tavana (2014) propose the adoption of environmental indicators in project management, such as: the materials to be used; the consumption of energy and water; impacts on biodiversity; emissions, effluents and waste, and transport.

Table 2.1: Environmental Impacts of Buildings and Construction Activities

Environmental Impacts		Potential Impacts On		
		Air	**Water**	**Solid and Land Cover**
Extracting raw materials	Sand and gravel	Particulate emissions	Watercourses near quarrels are altered	Landscape degradation
Manufacturing building material	Cement production	Particulate emissions **C**O, Sox and Nox	–	Deposition of dust
Constructing building	Transporting materials	NOx and CO2 emissions	–	Taking up new area of land
	Building sites	Noise, particulate Emissions	–	–
Using buildings	Energy consumption	CO2 emissions	–	–
	Water consumption	–	Waste water discharges containing detergent and organic matter	–
	Wear and tear of materials	Asbestos fibres, indo-or radon emissions	–	–
Demolishing buildings	–	Noise, particulate Emissions	–	Demolishing waste to be land filled or reused for sea reclamation

Source: Majdalani et al., (2006)

2.8 CHALLENGES ASSOCIATED WITH ENSURING ENVIRONMENTAL SUSTAINABILITY

According to Green Project Management (2012), sustainable concept remains vague at its best since there is lack of continuity by organizations who wishes to use sustainability to impact change in society. This can be attributed to limit environmental measures. According to Shen et al., (2006) some of these limitation measures include; mismatch between contract schedule and

implementing environmental management method, cost and the environment, static environmental culture within construction firms and lack of corporation.

Nonetheless there are numerous challenges in adopting green technology. Some of the challenges identified in employing green technology in Malaysian construction firm include; overlapping of roles, lack of skill and capacity in the subject area, lack of innovation and research, inadequate government support that slows down government programmes and inadequate understanding in ES it implication and solution. Hamid et al., (2011) compare the above obstacle to players of LEGO® who are able to build but do not deliver any substantial result. It is important therefore to address this issue in other to successfully implement Green Technology. To achieve this Sohal and Zutshi opine that it will be more relevant to adopt two ways communication, thus an effective communication between organization and its external and internal stakeholders to arrive at a successful implementation of ES.

2.9 STRATEGIES TO ENHANCE ENVIRONMENTAL SUSTAINABILITY IN PROJECT MANAGEMENT

The reduction of resource consumption can be achieved through careful planning, management and control, that are capable of determine the risk involved in environmental pollution (Inkuma and Nahmens, 2011). In the long run ES goal can only be achieved in a design that is eco friendly, promote human health, energy efficient and safe interior atmosphere. Align with the project management's goal, the Ministry of Energy, Green Technology and Water (KeTTHA, 2014) Malaysia sets national Green Technology policy objectives which include:

- To increase economic growth and reduce energy usage at the same period,
- To promote the growth of Green technology,

- To enhance capacity building in green technology,
- To promote the judicious use of resources to preserve it for future generation

Furthermore, Beard and Rees, (2000) suggest that firms and organizations can attain ES through effective environmental management that is innovative and creative capable of unlocking ideas. In addition, the government is also crating tax incentive that will encourage firms and organization to adopt sustainable practices (Hamid et. al., 2011).

Shirley and Maltzman (2010) also posits that sustainable practice are good for businesses in the sense that they help project managers to determine risk factors and find solutions to mitigate these factors. They revealed the following as the importance of adopting sustainable strategies;

- Running a green project do not only help team members in doing things right but it also enhance the organizations' performance as a whole.
- Employing environmental strategies increase the chance of a successful project
- It encourage long term thinking since sustainability in itself is a long term decision making
- Connect organization's Environmental Management Plan to project's objectives – and if there is no EMP, create or help create one.

Moreover, the governmental through the initiation of National Occupational Skills Standards and National Competency Standards organize skill training and create green jobs to absorb the trained workers. Again, Hamid et al (2011) also revealed that Green ICT working groups have been established to promote Green concept in the IT industry. The group is also charged with responsibility of setting guidelines that can be used across industries in the country and to also

encourage the establishment of a sustainable ICT through environmental friendly technology. All these initiatives are LEGO® pieces that connect together.

KeTTHA also suggested 5 strategic thrusts as following.

Thrust 1: strengthen the institutional Frameworks Strategic,

Thrust 2: provide conducive environment for GT Development Strategic,

Thrust 3: intensify human capital development in GT Strategic,

Thrust 4: intensify GT Research and Innovation Strategic,

Thrust 5: promotion and public awareness.

2.10 SUMMARY OF CHAPTER

This chapter discussed the concept of sustainability and project management, An overview and definition of sustainability and project management. It also provided discussion on the various process and knowledge areas in project management. The chapter further elaborated on environmental sustainability in relation to project management and lastly, emphasized on project management practices in Ghana.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The chapter seeks to provide detailed explanations on the method used for the research. The strategies adopted for the study is explicitly discussed. Also, the target population, sample size and survey instrument will be explained in this chapter. The chapter will also present the analytical tool used for data analysis as well as the mode of presentation of findings

3.2 RESEARCH DESIGN

According to Saunders et al. (2009), research design is the blue print of the study and entails the overall plan of the research as to how the research questions would be answered. There are three different general categories of research designs to choose from when conducting a research. These are exploratory, descriptive and explanatory research. The design of the research depends on the aim of the study and the current knowledge about the subject (Aaker et al., 2010). Similarly, Neuman (2003), opine that even though the designs differ from each other, yet they complement the other. Deciding to use any of them depend on what the research seeks to achieve, and type of information available (Naoum, 2002). This study therefore adopted the descriptive research design.

3.3 RESEARCH METHOD

Naoum, (1998) stated that there are two dimensions of research methods which are qualitative method and qualitative method. However, the availability of information for the research work determines the particular method to adapt (Baiden, 2006). Hence, the study employed a

quantitative research method. Primary data was collected from project managers, architects, civil engineers and Quantity Surveyors of D1K1 and D2K2 contractors in the Kumasi Metropolis. Naoum (2001) stated that to achieve the aim of a study, an important area to consider is the method adopted. A standard questionnaire was used to solicit the view of the sampled population since it was a survey. The questionnaire was a structured written set of questions that were completed by the sample being studied. An online or hard copy questionnaire can be used, but in this research the researcher used hard copy questionnaire due to the low-tech nature of the industry. Using hard copy questionnaire also afforded the researcher the opportunity to see and verify some information being provided by respondents.

3.4 STUDY POPULATION

A population can be described as the caliber of people or an element that the researcher is interested in (Castillo, 2009). A research population refers to a well-defined collection of individuals with similar or binding characteristics or traits. The study was conducted to investigate into incorporating environmental sustainability in project management in Ghana. The study population included project managers, architects, civil engineers and quantity surveyors of D1K1 and D2K2 contractors in the Kumasi Metropolis.

3.5 SAMPLE SIZE DETERMINATION

Sample-size determination is often vital, and almost always challenging. It requires care in choosing scientific objectives and in obtaining suitable quantitative data before the study commences (Lenth, 2001). Apart from the aim of the study and the magnitude of the population, three criteria usually will need to be stated to define the correct sample size: the level of

precision, the level of confidence or risk, and the degree of variability in the factors being evaluated or identified (Miaoulis and Michener, 1976). Moreover, Glenn (2012) suggested that the sample size can be determined using (i) figures in Published tables (ii) Sample size of similar studies (iii) A consensus for small populations and (iv) Formulas. However, due to the difficulty in determining the population size, a purposive sampling technique was adopted for the study. This resulted in a total number of fifty (50) respondents which serves as the sample size.

The researcher worked in conjunction with the management in choosing participants, based on their level of experience in project management and execution as well as their qualifications. Fifty (50) questionnaires were given out, and forty (40) people participated in the study. Some of the professionals were not available because they were off duty, had gone on holidays, while others could not participate due to their busy schedule.

3.6 SAMPLING TECHNIQUE

A sample is a fraction or subset of a greater group called the population. The best sample is a mini version of the population of which it is a part (Lenth, 2001). Sampling is therefore the process of choosing the research units from a target population. The sampling technique used for the study is purposive sampling technique. A purposive sample refers to selection of units based on personal sentiments rather than randomization. This judgmental sampling in some way is representative of the population of interest without sampling at random (Elder, 2009). According to Erbil et al (2010), the purposive sampling technique allows the researcher to select a respondent who has good knowledge of the subject under discussion. The reason for using this approach was that the researcher was seeking knowledge about the professionals' opinion on how environmental sustainability could be maintained in areas where projects areas where

projects are developed, which the participants would provide by virtue of their experience in managing projects.

3.7 TYPES AND SOURCES OF DATA

Generally there are two fundamental sources of data that is primary data and secondary data. Lancaster and Crowther (2008) argue that primary data is not available until it is generated by a research through research processes such surveys, observation, interviewing etc. however, secondary data is as an information that already exist which was not necessary collected by the particular researcher at hand.

This study used primary and secondary sources of data. The primary sources of data included information that was gathered from the questionnaires that were administered to the respondents. Primary data is more reliable since they come from the original sources and were collected exclusively for the purpose of the study.

3.7.1 PRIMARY RESEARCH DATA

Primary data are data that were previously unknown and which have been obtained directly by the researcher for a particular research project (Currie, 2005).The survey method was used for this study to collect information from respondents directly. Primary sources of data are tailored to a specific need and it has the ability to bring out the needed data from the respondents to produce effective analysis. This study relied on self-administered questionnaires because of the busy schedules of the respondents. The self-administered questionnaires enabled the respondents to complete the questionnaires at their own convenience and by so doing, getting responses that enabled the researcher to draw of valid conclusions.

3.8 DATA COLLECTION PROCEDURE

The study took two weeks to gather data from the field to accomplish this study. A sample of the survey questionnaire designed were given to key personnel who are project managers, architects, engineers, and quantity surveyors in the sample population to solicit their view on the subject being studied. Prior to the survey, the questionnaires were developed and tried on some project managers, architects and engineers at Consar Company Limited, Fapim Company Limited and Berock Company Limited all in Kumasi. The reason for this try was to examine whether questionnaire convey well the information the researcher wants to communicate or there were any kind of misunderstanding. The administration of the questionnaire was personally done by the researcher. This process of distribution and retrieving of the questionnaires in person was taken for two reasons as suggested by Ahadzie (2007). The first reason was to make sure that the questionnaires get to the intended recipients and secondly to help improve the response rate.

3.9 METHOD OF DATA ANALYSIS

Every research needs to be properly examined and interpret the data collected from the respondents. Neuman (2007) states that the method of analysis is very important to every survey approach. The demographic characteristics were analyzed using descriptive statistics such as frequency, percentages and mean. The analysis was done using the Statistical Package for Social Sciences (SPSS 17) version 17.0 in collating the data. The results were presented in the forms of charts and tables. The ordinal data were analyzed using Relative Agreement Index (RAI). This was done to determine the critical challenges project management face with the implementation of environmental sustainability practices in Ghana. The RAI is calculated using the formula (Fagbenle *et al,* 2004).

RII = **ΣW/nN**

Where RII = Relative importance index

Σw = respondent rating of severity of the challenges

N= sample size; n =the highest attainable score

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter of the research details the analysis and the discussion of the results obtained after the administration of the research instruments; the survey questionnaire which agitated data to provide the basis for this chapter. This chapter is divided into two sections. The first section deals with the background profile of the respondents. The second section captured detailed analysis of the specific objectives of the study. Utilizing the structured questionnaire, the negative impact of projects on the sustainability of the environment, challenges, and strategic measures to enhance the incorporation of environmental sustainability in project management were sought. Analysis and discussion of the results were then conducted. This includes Relative Importance Index rankings of data obtained in the field survey. This analysis forms the basis of conclusion the made in this study and helps to identify areas relating to this study which may be the focus of future research. A total of fifty (50) questionnaires were designed and administered to management professionals of D1K1 and D2K2 construction firms in the Kumasi metropolis which includes Project Managers, Engineers, Quantity Surveyors, Architects. Forty (40) questionnaires were retrieved and were adequate for analysis representing an 80% response rate. Richardson (2005) stated that a response rate of 60% or more is deemed adequate for a scientific research. Against this background, the response rate of 80% obtained for this study was deemed adequate for analysis.

4.2 RESPONDENTS PROFILE

Respondents' demographic information was analyzed by descriptive statistics which employed the IBM SPSS (International Business Machines Statistical Package for Social Sciences) statistics version 17. Table 4.1 shows the demographic profile of respondents. BSc holders (57.5%) greatly outstripped the other academic qualifications. HND (30.0%) and MSc holders (10%) had the second and third place respectively. Postgraduate Diploma (2.5%) least dominated the study. The probable low figures for the postgraduate Diploma could be that, project management requires high degree of intellectual ability and therefore personnel would require higher education in project management activities. In terms of the position in the construction firm, Engineers comprised 27.5% of the respondents, Project Managers27.5% of the respondents, and Quantity Surveyors comprising 25.0% of the respondents. However, the remaining 20.0% of the respondents were Architects.

Most of the respondents have between 6-10 years of professional practice in the in the construction industry. Altogether, more than one-quarter (37.5%) of the respondents have between 1-5 years' experience. Considering the respondents who were involved in the study, more than three-forth (80.0%) of the respondents indicated that they are members of professional bodies and 20.0% of the respondents indicated they did not belong to any professional body. The demographic profile of respondents shown in Table 4.1 illustrates that survey respondents are relatively BSc holders, often Engineers/Project Managers with between 6 to 10 years of professional practice experience who are normally registered members of the various professional bodies.

Table 4.1: Demographic profile of respondents (N=40)

Characteristics	Frequency	Percentage
Years in the Assembly		
1 – 5 years	15	37.5
6 – 10 years	18	45.0
11 – 15 years	5	12.5
Above 15 years	2	5.0
Academic Qualification		
BSc	23	57.5
MSc	4	10.0
HND	12	30.0
PG Diploma	1	2.5
Position in Assembly		
Engineer	11	27.5
Project Managers	11	27.5
Quantity Surveyor	10	25.0
Architect	8	20.0
Professional Affiliation		
Yes	32	80.0
No	8	20.0

Source: Researcher's survey (2018)

4.3 NEGATIVE IMPACTS OF PROJECTS ON THE SUSTAINABILITY OF THE ENVIRONMENT

Descriptive analysis such as relative importance index of each of the negative impact variables assisted in providing a vibrant representation of the outcome of the survey; and the results are presented in Table 4.2. With the five-point Likert rating scale, a variable was randomly reflected critical if it had a mean value of 3.50 or more (Field, 2013). From Table 4.2, all the variables

have mean values above the accepted population mean of 3.5, it is therefore rational to deduce that they constitute the most significant negative impact of projects on the sustainability of the environment. The highest responsive negative impact variable from the table is: air pollution, followed by the second highest: destruction of virgin lands and the third highest variable is: noise pollution. Furthermore, the fourth highest variable is: depletion of the ozone layer and the fifth highest variable is: landscape degradation. The least responsive causes variable is: unclaimed landsite. This confirms Silvius and Schipper (2014) most construction activities affect the environment negatively and this include destruction of vegetation, air pollution, noise and landscape degradation. Furthermore, the negative impacts of project on the sustainability of the environment as indicated by respondents confirm studies by Yusof et al. (2016), Green et al. (2015), and Son et al. (2011).

Table 4.2: Negative impact of projects on the sustainability of the environment

	RATING									
NEGATIVE IMPACTS	**1**	**2**	**3**	**4**	**5**	**Total**	**∑W**	**Mean**	**RAI**	**Rank**
Air pollution	0	5	5	17	13	40	158	3.95	0.79	1st
Destruction of virgin lands	1	4	10	12	13	40	158	3.95	0.78	2nd
Noise pollution	0	4	7	20	9	40	154	3.85	0.77	3rd
Depletion of the ozone layer	0	5	9	14	12	40	153	3.83	0.76	4th
Landscape degradation	0	5	9	15	11	40	152	3.80	0.75	5th
Waste water discharge into the environment	1	6	7	12	14	40	152	3.80	0.74	6th
Diversion of water courses	1	3	9	20	7	40	149	3.73	0.73	7th
Wastage of portable water	0	4	11	17	8	40	149	3.73	0.72	8th
Heat emission	0	5	9	19	7	40	148	3.70	0.71	9th
Unclaimed landsite	1	0	18	12	9	40	148	3.70	0.70	10th

4.4 CHALLENGES ASSOCIATED WITH INCORPORATING ENVIRONMENTAL SUSTAINABILITY INTO PROJECT MANAGEMENT PRACTICES

From Table 4.3, which represents the challenges associated with incorporating environmental sustainability in project management practices, slow government programs is the most ranked challenge according to respondents with an RAI and mean values (0.84, 4.18) respectively whereas lack of public education is also the second ranked challenge with an RAI and mean values of (0.83, 4.15) respectively. This is an indication that slow government programs and lack of public education are significant challenges associated with incorporating environmental sustainability in project management practices. According to Shen et al., (2006) some of these limitation measures include; mismatch between contract schedule and implementing environmental management method, cost and the environment, static environmental culture within construction firms and lack of corporation. Overlapping of roles, lack of skill and capacity in the subject area, lack of innovation and research, inadequate government support that slows down government programmes, inadequate understanding in ES it implication and solution are very key challenges ((Hamid et al., 2011). The other variables were also ranked as follows; lack of support from top management(3^{rd}), lack of understanding on environmental implications(4^{th}), higher initial associated costs(5^{th}),lack of research and innovations(6^{th}), lack of supervision by leaders(7^{th}), lack of social drive / responsibility(8^{th}), lack of stringent policies and laws(9^{th}), lack of training and education about sustainable design(10^{th}), poor communication(11^{th}),low stakeholder education(12^{th}), lack of interest in adoption of innovative practices (13^{th}), lack of skill ad capacity(14^{th}), and uncertainty of benefits to the client(15^{th}).The most significant challenges as indicated by respondents confirm the studies by Hamid et al. (2011), and Zutshi and Sohal (2004).

Table 4.3: Challenges associated with the incorporation of environmental sustainability into project management practices

	RATING									
CHALLENGES	**1**	**2**	**3**	**4**	**5**	**Total**	**∑W**	**Mean**	**RAI**	**Rank**
Slow government programs	0	0	7	19	14	40	167	4.18	0.84	1st
Lack of public education	0	3	2	21	14	40	166	4.15	0.83	2nd
Lack of support from top management	0	1	5	21	13	40	166	4.15	0.82	3rd
Lack of understanding on environmental implications	0	0	8	18	14	40	166	4.15	0.81	4th
Higher initial associated costs	0	0	8	20	12	40	164	4.10	0.80	5th
Lack of research and innovations	1	0	8	17	14	40	163	4.08	0.79	6th
Lack of supervision by leaders	1	2	7	15	15	40	161	4.03	0.78	7th
Lack of social drive / responsibility	0	2	7	20	11	40	160	4.00	0.76	8th
Lack of stringent policies and laws	1	2	8	14	15	40	160	4.00	0.75	9th
Lack of training and education about sustainable design	0	1	9	21	9	40	158	3.95	0.74	10th
Poor communication	0	1	10	19	10	40	158	3.95	0.73	11th
Low stakeholder education	1	1	14	12	12	40	153	3.83	0.72	12th
Lack of interest in adoption of innovative practices	0	2	11	21	6	40	151	3.78	0.71	13th
Lack of skill ad capacity	1	2	11	18	8	40	150	3.75	0.70	14th
Uncertainty of benefits to the client	0	2	14	17	7	40	149	3.73	0.69	15th

4.5 STRATEGIES TO ENHANCE THE INCORPORATION OF ENVIRONMENTAL SUSTAINABILITY IN PROJECT MANAGEMENT

Descriptive analysis such as relative importance index of each of the strategies variables assisted in providing a vibrant representation of the outcome of the survey; and the results are presented in Table 4.4. With the five-point Likert rating scale, a variable was randomly reflected critical if it had a mean value of 3.50 or more (Field, 2013). From Table 4.2, all the variables have mean values above the accepted population mean of 3.5, it is therefore rational to deduce that they constitute the most significant strategies to enhance the incorporation of environmental sustainability in project management. The highest responsive strategies variable from the table is: considering environmental sustainability at planning and design stage, followed by the second highest: effective legislative framework and the third highest variable is: creating awareness programs. Furthermore, the fourth highest variable is: project managers must be agent of change and the fifth highest variable is: creating green ICT working group. The least responsive strategies variable is: integrating green topics into national education systems. This confirms Nahmens and Ikuma, (2011) argument that a reduced resource consumption is possible through effective environmental planning, management and control, and identification of environmental risk and prevention of water, ground and air pollution. Furthermore, the strategies to enhance the incorporation of environmental sustainability in project management indicated by respondents confirm studies by Nahmens and Ikuma (2011), Darwish (2014), and Hamid et al. (2011).

Table 4.4: Effective project management strategies enhance incorporation of environmental sustainability in Ghana.

	RATING									
STRATEGIES	**1**	**2**	**3**	**4**	**5**	**Total**	**∑W**	**Mean**	**RAI**	**Rank**
Considering environmental sustainability at planning and design stage	0	0	6	14	20	40	174	4.35	0.87	1st
Effective legislative framework	1	0	5	13	21	40	173	4.33	0.86	2nd
Creating awareness programs	0	0	5	18	17	40	172	4.3	0.85	3rd
Project managers must be agent of change	0	1	4	19	16	40	170	4.25	0.84	4th
Creating green ICT working group	0	0	6	18	16	40	170	4.25	0.83	5th
Ensuring quality and sustainability	1	0	6	19	14	40	165	4.13	0.82	6th
Recognition of environmental sustainability by top management	0	0	12	12	16	40	164	4.1	0.81	7th
Research and development	1	1	8	15	15	40	162	4.05	0.80	8th
Restoration of vegetation	0	1	7	20	12	40	162	4.05	0.79	9th
Integrating green topics into national education systems	0	0	11	16	13	40	162	4.05	0.78	10th

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This study is aimed at identifying ways of incorporating environmental sustainability into project management practices in Ghana. To achieve this aim, three objectives were set. To achieve the objectives, a critical literature review was conducted where the project management practiceswas exployed leading to the development of a questionaire to collect emperical data from respondents in the construction industry. The analysis conducted with each of the objectives are presented in the following sub sections.

5.2 ACHIEVING THE RESEARCH OBJECTIVES

5.2.1 The First Objective; To identify the negative impacts of projects on the sustainability of the environment

With the background knowledge on the negative impacts gained from literature, a questionnaire was designed to address the first objective, of which 10 variables were identified which was then tested on a number of professionals working in the Kumasi metropolis. The literature sources from which these causes were identified included; Yusof et al. (2016), Green et al. (2015), and Son et al. (2011) among others. The questions highlighted on negative impacts such as Noise pollution, Landscape degradation, Air pollution, Higher rainfall upstream from their main channels and tributaries, Climatic changes, Diversion of water courses, Heat emission, Unclaimed landsite, Improper waste management, Destruction of virgin lands, and Waste water discharge into the environment. Relative Importance Index (RII) was used to rank the causes and then discussed.

5.2.2 The Second Objective; To identify the challenges associated with incorporating environmental sustainability into project management practices in Ghana

To achieve this objective, literature study was conducted to identify the challenges associated with incorporating environmental sustainability into project management practices as revealed by other researchers. The literature sources from which these challenges were identified included; Hamid et al. (2011), and Zutshi and Sohal (2004) among others. In all, a total of 15challenges were identified from the literature. The identified challenges were then included in the research questionnaire which was used to gather empirical data. The collected data was then analyzed using the Relative importance index.

5.2.3 The Third Objective; To identify effective strategies to enhance incorporation of environmental sustainability in project management

A similar approach of literature review was conducted to identify effective strategies to enhance incorporation of environmental sustainability in project management. The literature review led to the identification of ten variables that were stated by other researchers as strategies to enhance incorporation of environmental sustainability in project management. The literature sources from which these strategies were identified included; Nahmens and Ikuma (2011), Darwish (2014), and Hamid et al. (2011) among others. The identified strategies were then analyzed with the Relative Importance Index.

5.3 CONCLUSION

Sustainability concerns in delivering construction projects have come to the fore front of world, and the gap between project management and sustainability is still been built. However, there challenges associated with incorporating environmental sustainability into project management

practices. However, there are some strategies to enhance incorporation of environmental sustainability in project management. This would help improve the negative impacts of projects on the environment.

5.4 RECOMMENDATIONS

- There should be public education on how environmental sustainability could be incorporated into project management practices.
- Management should provide adequate support in incorporating environmental sustainability into project management practices.
- Government should enact laws to incorporate environmental sustainability int project management.

5.5 LIMITATIONS OF THE RESEARCH

Like any other scientific study, this study also had some limitations which are listed below:

- The limitation of the survey the Kumasi metropolis alone may affect the generalizations of the findings.
- The analytical tool used for the analysis may affect the generalization of the results of the study.

5.6 DIRECTIONS FOR FUTURE RESEARCH

The study focused in the Kumasi metropolis. A similar study could be conducted in other jurisdictions where data could be gathered to aid the extent of generalization of the findings.

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APPENDIX 1 QUESTIONNAIRE

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI, GHANA

COLLEGE OF ART AND BUILT ENVIRONMENT

DEPARTMENT OF CONSTRUCTION TECHNOLOGY AND MANAGEMENT

SURVEY QUESTIONNAIRE

INCORPORATING ENVIRONMENTAL SUSTAINABILITY IN PROJECT MANAGEMENT PPRACTICES IN GHANA

Confidential survey questionnaire

Dear Sir/Madam,

I am an MSc project management student in the Kwame Nkrumah University of Science and Technology, College of Built Environment, Department of Building Technology currently undertaking a research into Incorporating Environmental Sustainability In Project Management Practices In Ghana.

The study is ongoing under the supervision of Professor Joshua Ayarkwa.

The research requires a questionnaire survey to collect data from professionals in project management.

Be aware of your busy schedule, I will plead to request for 15 minutes of your time to fill in the questionnaire as it deemed necessary for the achievement of this research. All information provided will be kept strictly confidential and for academic purpose.

Findings from this research will be made available to you on request by (calling …….
0242876990 or email-kfrimpong6@yahoo.com)

Yours sincerely,

……
Francis Frimpong, MSc. Student (KNUST).

PROF. Joshua Ayarkwa, Project Supervisor, Department of Building Technology (KNUST)

SECTION A: RESPONDENT PROFILE

Please tick answers where applicable for the following questions: [√]

1. What is your professional role in your organization?

a. Architect [ ]
b. Project Manager [ ]
c. Civil Engineer [ ]
d. Quantity Surveyor [ ]
e. Other Specify……..

2. What is your highest educational level?

a. Higher National Diploma (HND) [ ]
b. Bachelor Degree [ ]
c. PG Dip [ ]
d. MBA / MSc /MPhil [ ]
e. Others (Specify)…….

3. How long have you been working in your present capacity?

a. 3 – 5 years
b. 5 - 10 years
c. 11 - 15 years
d. Above 15 years

4. Are you a member of a professional body / bodies

Yes [ ]
No [ ]

5. Are you involved in the Environmental sustainability policies making in your Firm?

Yes [ ]
No [ ]

Q.6 Does your organization has a formal environmental sustainability policy in project management?

[Yes] [ ]
[No] [ ]

Q.7 Does your organization has mechanisms set to check if environmental sustainability policies and procedures are followed as planned?

[Yes] [ ]
[No] [ ]

SECTION B:

The subsequent questions require your knowledge and concerns in areas of negative impacts of project management on Environmental Sustainability in Ghana. Each question has its rankings with their meanings. Kindly tick your answers accordingly.

1 = Strongly disagree **2** = Disagree **3** = Neutral **4** = Agree **5** = Strongly agree

Negative Impacts	**Levels**				
Rank the following according to the negative impacts on the environment by the activities of project management.	1	2	3	4	5
1. Air pollution eg. dust, smoke etc					
2. Destruction of virgin lands					
3. Noise pollution					
4. Landscape degradation					
5. Waste water discharge into the environment					
6. Diversion of water courses					
7. Depletion of the ozone layer					
8. Wastage of portable water					
9. Heat emission					
10. Unclaimed landsite					

SECTION C:

The challenges involved in ensuring environmental sustainability in project management practices in Ghana.

Challenges	**Levels**				
What do you think are the primary challenges to the effective implementation of environmental sustainability in project management?	1	2	3	4	5
i. Lack of public education					
ii. Lack of support from top management					
iii. Higher initial associated costs					
iv. Lack of social drive / responsibility					
v. Lack of adequate supervision by leaders of team engaged in developing projects					
vi. Slow government programs					
vii. Lack of research and innovations					
viii. Low stakeholder education					
ix. Lack of training and education about sustainable design					
x. Lack of stringent policies and laws					
xi. Lack of interest in the adoption of innovative practices					
xii. Uncertainty of benefits to the client					
xiii. Lack of skill and capacity in the area of environmental sustainability at both technical and management level					
xiv. Lack of understanding on environmental implications and its solutions and cost verses benefits in terms of green implementation.					
xv. Two way communication between the organizations and its internal and external stakeholders.					

SECTION D:

Strategies to enhance environmental sustainability in project management practices in Ghana;

Strategies	**Levels**				
What do you think are the most adequate strategies to the effective implementation of environmental sustainability in project management?	1	2	3	4	5
i. Research and development					
ii. Restoration of vegetation					
iii. Effective legislative framework to ensure green technology by the Government.					
iv. Recognition of environmental sustainability by top management.					
v. Creating awareness programs to educate the general public and organizations about the relevance of environmental sustainability.					
vi. Considering environmental sustainability at the planning and design stages in projects					
vii. Project managers must be agent of change and create environmental management plan to project objectives.					
viii. project managers must ensure that both quality and sustainability are built into our thinking about a project, rather than bolted on as an afterthought.					
ix. The Government of Ghana should integrates green topics into the national education system and increase modules and courses relating to green technology in higher institutions.					
xi. Creating green ICT working group to actively promote the Green ICT concept in relation to ICT industry.					

Thank you very much, I am most grateful.