

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

**AN EXPLORATORY STUDY INTO PROMOTING SUSTAINABLE
CONSTRUCTION IN GHANA THROUGH PUBLIC WORKS PROCUREMENT**

BY

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**MASTER OF SCIENCE IN
PROCUREMENT MANAGEMENT**

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DECLARATION

I hereby declare that this submission is my own original research and that, to the best of my knowledge, it contains no material previously published by another person or material which has been accepted for the award of any other degree of this University or any other institution. References from the works of others have been duly acknowledged.

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ABSTRACT

Sustainable construction is very important so far as the world's population continues to grow. Population growth comes along with increase in construction works and its impact on energy consumption, waste production and water consumption. Sustainable construction will create an avenue that will encourage public works procurement officials to use construction methods to increase economic growth as well as reduce the impact of construction on the environment. This will bring attendant benefits such as employment creation and a much healthy environment. This research applied the use of self- administered questionnaires to assess the level of knowledge of sustainable construction among works procurement practitioners, to identify some challenges in sustainable construction and recommend measures for improving on sustainable construction in Ghana. A survey was conducted among procurement officials from 3 local governments' authorities in Accra with a sample size of 39, through convenience sampling. The research revealed among others that there is some level of awareness on sustainable construction among the public officials but was not widespread. It was also discovered that there was a lack of legal and regulatory framework to compel procurement officials to implement sustainable construction practices. Challenges such as the lack of research into sustainable construction, little incentives for procurement officials, lack of public awareness, lack of interest in sustainability issues, poverty and perceived high cost of initial investment were identified. The research also recommended the intensification of education on sustainable construction practices, increase research on sustainable construction and a clear policy with some amendment in the Public Procurement Act (Act 663) as some measures to improve sustainable construction in public works procurement.

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DEDICATION

This study is dedicated to my parents, siblings and friends.

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CHAPTER ONE

1.1 General Introduction

All across the world, construction has an impact on the physical environment. Major Construction projects have a direct impact on the economy and for that matter, society at large. Its contribution to GDP and employment is immense. Construction projects adversely affect the environment through pollution of the environment, indiscriminate disposal of construction waste and logging (Lui 1999).

Construction for the purposes of this thesis refers to the clearing, dredging, excavating, and grading of land and other activities associated with building structures or other types of real property such as bridges, road and rail. Sustainable construction involves undertaking construction works in a way that promotes economic development, social progress and environmental stewardship. Construction plays a very critical role in the development of every society. It provides shelter through housing projects, supports education through the building of class room blocks and other facilities that enhance teaching and learning. It also connects people through roads, bridges, railways and airports. There should be a major focus on sustainability in the process of designing, planning, Construction and maintenance of new and existing infrastructure.

A careful choice in relation to the materials used in construction can make significant changes in dealing with the negative effects of construction on the environment (Wahlstrom et al 2014). Tackling the issues of sustainable construction can also bring about new economic opportunities. A clear public policy on sustainability will encourage sustainable construction procurement, which will lead to signaling industry of governments

preference, for sustainability products and will provide an incentive to develop and produce products to meet the demands of the construction industry. This will create new opportunities with employment and ensure value for money not only on the purchase price but across the whole life cycle, with sustainable construction in public works. The promotion of sustainable construction in Public works procurement will offer a unique chance to promote economic, environmental and social development. Due to the role and quantum of construction procurement in public works, government should take advantage of this to benefit the larger society.

1.2 Statement of problem

Sustainable procurement is not prominent in the Public Procurement Act 663. The Public Procurement Act 663 (2003) does not provide directly for sustainable procurement and for that matter Sustainable construction. A sustainability criterion is hardly visible in the procurement process itself. Ghana seems to be lagging behind in the sustainability movement which is a major concern all over the world. There is currently some education and drive by the Public Procurement Authority on sustainability through workshops and training programs for some public officials. This thesis therefore seeks to explore how to promote sustainable construction through public works procurement in Ghana.

1.3 Aim of the study

The goal of this thesis is to seek measures to improve sustainable Construction through public works procurement in Ghana.

1.4 Objectives of the study

To attain the above aim, the following objectives were achieved:

1. Assess the level of knowledge of key stakeholders in procurement on sustainable construction.
2. Identify challenges in the use of sustainable construction in the procurement of Public works.
3. Suggest measures to improve sustainable construction at key stages in works procurement.

1.5 Research questions

The research also sought answers to the following questions:

1. What is the level of knowledge on sustainable construction among key stakeholders in public works procurement?
2. What are the challenges of sustainable construction in Public Works Procurement?
3. What are the key measures that should be put in place to improve sustainable construction in Public Works Procurement?

1.6 Scope of the study

This thesis examines the state of sustainable construction in the procurement of public works in Ghana. It explores the broader issues of sustainability with major emphasis on sustainable construction procurement in public works. Sustainable construction strategies and approaches in industrialized and developing countries with a view to identifying and

learning from emerging Good Practices. In examining the state of sustainable construction, it focuses on some Municipal Assemblies in the Greater Accra region of Ghana due to some limitations. In order to expand the information base, expert opinions are captured through self administered questionnaires across key stakeholder groups and additional perceptions are collected using the Internet.

1.7 Significance

Due to the adverse effects construction activities have on the society, improving on sustainable Construction in public works procurement will help reduce the negative impact of construction and rather increase the positives. This will in a small way fit into the long term development agenda of the country as amplified in the late president Attah Mills speech to parliament on December 2010 entitled, the coordinated program of economic and social development. Under policies of Ghana 2010-2016, he stated that the main objective of government was to reduce poverty through economic growth that considers greatly environmental issues and equitable distribution of wealth. Sustainable construction in public works procurement will help achieve economic growth and social development and reduce the adverse effects of construction on the environment.

1.8 Organization of the study

This study is in five chapters with chapter one of the thesis giving an introduction into the study, problem statement, research question, research aims, objectives, and significance of the study. It is then followed by chapter two where the relevant literature on sustainable

procurement and sustainable construction around the world are reviewed. Chapter three is based on the most suitable research methodology for this thesis. Chapter four presents data analysis, findings and discussions and chapter five finally presents a summary of findings, conclusion, and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Sustainable procurement plays a vital role in sustainable development. Sustainable development is improving the quality of life for the world at present and the future through social, economic and environmental development by efficiently using and maintaining the natural resource whiles at the same time, economically empowering communities and employment generation (Malik 2002). The Amsterdam Treaty captures best the definition of sustainability in a developing country like Ghana. It defines sustainability as a determination to achieve socio-economic development within the broader framework of sustainable development goals through policies that combine economic development with other related fields like social and economic issues. Sustainable procurement is derived from the broader concept of sustainable development. Governments have immense purchasing power to direct the market on what is acceptable to produce through procurement. They can do this by using sustainable development criteria in the selection and demand of certain goods, works and services. Sustainable construction is an aspect of sustainable procurement. Sustainable construction is sustainable procurement in construction. According to Kibert (2004), sustainable construction could be best defined as establishing a healthy built environment through an efficient use of resources whiles protecting the ecology. Du Plessis (2002) takes a holistic view in his definition. He defines sustainable construction to mean, applying sustainable development principles in the entire construction process. These processes will include raw material extraction, design, construction, deconstruction and resultant

management of waste. Sustainable construction involves the use of innovative ways to incorporate sustainable development themes in construction. Sustainable construction is therefore also part of sustainable development. This will comprise of designing, the bidding process, selection of materials, recycling and minimizing waste (Langston and Ding 2001). Sustainable construction is part of a strategy for achieving sustainable procurement. Sustainable procurement and sustainable construction for that matter is part of a process to find solutions to the problems of sustainable development.

2.2 Sustainable procurement

Communities are bearing the brunt of unchecked consumption which has led to damage to the ecosystem. Some of the activities that have caused these include human actions such as the emission of harmful and toxic substances into water or atmosphere, generation of waste, consumption of natural resources and damage to the eco system (Lui 1999). A shift in production and consumption patterns is vital in addressing this negative impact. This means using the tax payer's money efficiently through government purchasing decisions by considering social, economic and environmental impact on society. That is, creating value in the procurement of goods, services and works by emphasizing on social, economic and environmental issues. The United Kingdom Sustainable Procurement Task Force also defines sustainable procurement by introducing the concept of value for money and whole life costing. In procuring goods, services and works, there should be the ultimate aim of achieving value for money through life cycle costing. It aims at achieving greater benefits to the society, economy and environment. In order to attain this, the effects on material use,

methods of production and design among others are considered. (Chartered Institute of Purchasing & Supply 2011).

The Public sector is a huge market with several opportunities. Due to this huge market, the private sector depends a lot on government contracts for survival. The public sector can take advantage of its huge market size to demand for sustainable goods, services and works. This can aid government greatly to achieve such objective like gender equity, small business development and environmental protection. Government must ensure that it demands for certain goods, services and works that meet a set sustainability standard. This power is highly known and growing. Measures should be put in place to enhance communication and collaboration between suppliers and government procurement entities through set requirements in the tendering process. An effective implementation of sustainable procurement will further enhance the achievement of sustainable development goals of economic, social, and environmental issues, which will help improve efficiency and competitiveness in the procurement process. Procurement is not simply about the purchasing of goods, services and works. Procurement also has to be timely, efficient, effective, competitive, equitable and transparent. Public procurement should serve as a catalyst for private sector development in a country.

2.3 A guide to developing a sustainable public procurement policy

A developing country like Ghana with all its efforts to achieve sustainable procurement has no guiding document for its implementation. Such policy document will serve as a guide and set standards for proper implementation and application. Any effort for such proper implementation document will need to follow best practices. To this end, there is the

Marrakech guideline on sustainable procurement which serves as a template for proper implementation and drafting of an operating document for sustainable procurement. It is a document that has the objective of helping countries to incorporate economic, social and environmental considerations in their procurement decisions. It sets out the following:

- Good procurement is sustainable procurement
- Leadership
- Policy through procurement
- Enabling delivery
- Implementation
- Monitoring results and outcomes

2.3.1 Good procurement is sustainable procurement

Good procurement should include the three sustainable development themes of social, environmental and economic. Apart from these, procurement without transparency, fairness, non-discrimination, competition, accountability, and verifiability is flawed. There is a relationship between the essential elements of procurement and the pillars of sustainable procurement. The elements of procurement are means of achieving sustainable procurement. Due to the global nature of Procurement operations, it is important to take a holistic view on the impact of sustainable procurement.

2.3.2 Leadership

Higher level leadership and best practice will ensure that resources are provided for delivery and excellence. This will ensure that procurement achieve its aim. The involvement of

leadership will serve as an impetus to drive the entire organization to set objectives in sustainable procurement. It will also help in strategy formulation and allocation of resources to ensure effective implementation of set strategies and targets.

2.3.3 Policy through procurement

For a successful implementation of sustainable procurement, there should be a clear policy in place. A clear policy will serve as a compass to direct procurement entities in their procurement decisions. One might achieve some results in some cases but a policy will eliminate dispute and reduce the use of discretion. Policies are basic principles by which an organization seeks to achieve set goals. Policy makers should have an appreciable level of knowledge on procurement operations in order to aid in producing implementable policies.

2.3.4 Enabling delivery

Everyone has a role to play in enabling sustainable procurement. There should be proper engagement and collaboration between the players in procurement to ensure successful implementation. Major players like Policy-makers, suppliers, contractors as well as procurement entities should equip themselves with some high level of skills like negotiation and communication skills to create an enabling environment for the implementation of sustainable procurement. There should be collaboration with the market to produce effectively to meet the demands of procurement entities. Everyone has a role to play in enabling sustainable public procurement. Availability of incentives for accountability and penalties to encourage compliance will enable sustainable procurement delivery.

2.3.5 Implementation

Implementation is paramount in every project. Policies adopted must carefully be implemented to achieve set goals. Sustainable Public Procurement must be based on careful prioritization and risk assessment. To attain the greatest benefit, a long term view should be sought through measures like the principle of continuous improvement and a life cycle approach to costing.

2.3.6 Monitoring results and outcome

There should be proper Monitoring of results and outcomes delivered through Sustainable Public Procurement. Monitoring can be through several parameters which will be set and adhered to. Such parameters will guide the entity in measuring its performance and will also inform them in identifying areas of strength or weakness. The parameters will be tied to social (job creation and minority empowerment), economic (development of local economy, cost savings) and environmental (reforestation) themes.

2.3.7 Legal Review for effective sustainable procurement policy

According to the U.N.E.P sustainable Public Procurement implementation Guideline, to avoid legal uncertainties and enhance implementation, there should be a careful look at the legal framework within a country. To ensure coherency and secure political support in sustainable public procurement, there should be a legal review, which is the analysis of the legal and regulatory framework of a country. Any Legal Review undertaken should be aimed at understanding how sustainable procurement policies can be implemented within

the framework of existing laws. Legal review will assess the practical application of such laws. It will also see to it that it does not conflict with other laws.

2.4 Scope and content of the Legal Review

To undertake any legal review, one should begin with taking a holistic look at the international, national agreements and laws. A legal review should consider a country's commitment to international organization like the World Bank, the United Nations and other multi lateral finance organizations. The legal review should also consider the country's commitment to international trade agreements with organization like the world trade organization. These reviews should be done within the legal framework of the national constitution. The following has been outlined as the scope and content of a legal review:

B. Constitutional and Administrative Law Frameworks:

Sustainable procurement covers social issues such as human rights and the environment as well. To ensure uniformity, a careful look at the constitution and what it says on such issues is very important. This will ensure that procurement laws will not conflict with constitutional, administrative laws and its interpretation. If this is done well, it will be easy to promote mindset change without necessarily changing the constitution.

C. Public Procurement Regulations and Goals:

A legal review should be done within the context of the major public procurement objective of accountability, transparency and best value for money. This review and analysis will help make policy decisions, where there is a conflict between certain procurement goals and objectives. Issues such as the kind of procurement system should also be of great consideration. The systems of procurement whether centralized or decentralized should also

be clear. Matters bordering on the extent of powers and authority of procurement officials should be known. Threshold levels and limits should be agreed on to ensure discretionary powers are curtailed.

D. Sustainable Development Policies and Sustainable Procurement Mandates:

There should also be made available by government an authority or power in whatever policy decisions taken by procurement entities. Such authority or power is what will give procurement entities the backing to integrate social, economic and environmental issues in public procurement decisions. Organizations should look out to government for a policy mandate to incorporate sustainability issues into public procurement. Such authority can be derived from legal, regulatory and policy direction of government. There is a direction of policies towards economic policies. This is due to the fact that government has always strived towards achieving efficiency in economic activities. It also serves as a means for achieving a controlled public expenditure. Other sustainability themes can be targeted depending on the level of development in a country. Developing countries turn to concentrate more on social themes than the others. Economic and environmental issues are considered but with less intensity and vigor in public procurement decisions. In policy formulation, it is important to make clear objectives to serve as a guide in the enactment of laws. (UNEP Sustainable Procurement 2008).

2.5 Prioritizations Exercise

As stated in the UNEP Sustainable Procurement (2008), there should be a prioritization exercise which will aim at identifying priority products and services in implementing a sustainable procurement policy to promote sustainable construction.

An entity should be guided by the following steps in conducting the prioritization.

1. Agree and identify areas of priority in sustainable development.
2. Expenditure analysis;
3. Assessing opportunities and areas of risk;
4. Finally prioritizing products and services.

2.5.1 Agree and identify areas of priority in sustainable development.

Through this, sustainable development goals can be achieved. It involves identifying government sustainable development goals so that strategies will be employed to achieve such objectives. When objectives are certain and well documented, it will allow for targeting organizational efforts on such aims. This will also help in decisions concerning allocation of resources. Prioritization will also aid in coordinating the activities of key stakeholders to achieve desired goals and objectives. Promoting sustainable procurement requires focus and direction which will be achieved through prioritization. Depending on the needs and pertaining challenges, an organization or country will adopt strategies in such direction. For instance a country may choose to concentrate on issues such as employment generation or environmental protection based on their peculiar situation, needs and importance attached to such issues. Where there is an absence of policy on sustainability, on- going program relating to gender equality, minimizing pollution, protection of natural resource, waste generation, Reports of the World Bank, United Nations Development Program, and biodiversity documents can be relied upon. This activity creates a blue print of sustainability issues to be tackled in order of preference and importance. These issues may include but not limited to the following:

- Employment generation
- Ecological protection
- Protection of minority groups in society
- Development of local economic activities
- Transparency and accountability in the procurement process
- Value for money objectives

In order to promote efficiency, there should be a focus on key issues so that procurement resources will be targeted and focused.

2.5.2 Expenditure analysis;

The amount countries spend can be vital indicators from which sustainable procurement impacts can be derived. This will measure and assess the spending patterns on various items and departments of the organization. This analysis will help improve on efficiency by adopting measures like aggregating demand to encourage bulk purchases. Bulk purchases will lead to cost saving through reduced prices and discounts. This will also help identify departments that are overspending in order to put them in line to achieve economic efficiency and check budget over runs.

2.5.3 Assessing opportunities and areas of risk;

Assessing opportunities and areas of risk is important, after going through prioritization and expenditure analysis. Risk is a likelihood of negative outcome. It is also a probability of damage, injury, liability, loss or any other negative occurrences that is caused by weaknesses within or outside the control of an organization. Early detection is paramount to

the future of every organization. For early detection of risk, there should be an analysis which will determine products of risk in terms of cost and effects on the environment. Strategies will then have to be adopted to reduce or turn this around into positives. Risk can be accepted, shared or transferred depending on the situation at hand. In certain situations, circumstances can be exploited for a better outcome. An assessment should consider various sustainable procurement decisions and find other ways of getting the best out of each situation.

2.5.4 Finally prioritizing products and services.

In final prioritization of products and services, there should be proper understanding of the importance of sustainability issues, identification of areas of improvement and the readiness of the private sector to respond or meet sustainability demands. Key sustainability issues should be ranked according to its level of importance to help tackle such issues properly. This will involve key policy officials, extensive consultations and will use such method as the Delphi method.

2.6 Market Readiness Analysis

This requires the assessment of the private sectors preparedness to cater for the sustainable needs of organizations. Since the private sector is the main supplier of government needs, the public procurement authority should find out if they have the capacity to meet their changing needs. Any policy will not derive the highest benefit if there is not enough private sector participation. Government should assist the private sector in preparation to meet sustainable demands by helping them to build their capacity. Relevant tools for setting

standards should also be set to guide the private sector in their readiness. A ready market will ensure a smooth implementation of a sustainable procurement policy. Market readiness involves Relationship to other stages of the process.

2.6.1 Relationship to other stages and studies

There should be an interrelationship between market readiness and other aspects like prioritization and legal review. This will ensure a successful implementation of a sustainable procurement plan. It will also help identify important areas where more effort should be concentrated in order to maintain some level of consistency and coherence.

2.6.2 Scope and content of the Market Readiness Analysis

This will entail identifying key products with its level of importance and expenditure. It will also involve the associated cost and value of such product. This identifies areas of inclusion and exclusion. By so doing, different levels of help and strategy can be adopted. The content of a market readiness analysis also involves targeting products that can have a great impact on achieving sustainable procurement goals. Market readiness will aid in reducing cost on sustainable procurement (UNDP practice series 2008).

2.7 Impact of construction on the society

There are enormous effects of construction activities on the environment. Some of these have been enumerated by Spence and Mulligan (1995) as the following, 10-15% use of energy through the burning of fossil fuel which has a negative impact on the environment. The manufacturing of building materials such as cement also causes great harm to the

environment by contributing to about 9-21 percent of the world's carbon dioxide emissions. Construction activities like roads and quarrying have had very negative effects on the ecosystem, destroyed other life forms and livelihood.

Spence and Mulligan (1995) gives a comprehensive overview of some environmental impacts resulting from the construction industry. These include: Use of fossil fuels (due to energy use for the production and operation of buildings). The use of energy in the production phase represents only about 10-15 % of the total lifetime energy use, Atmospheric pollution (the construction sector is responsible for a large amount of atmospheric pollution resulting from fossil fuel consumption and cement manufacturing). Manufacturing of building materials contributes 8-20 % of total carbon dioxide emissions of the construction sector.

The construction sector also contributes to the creation of ozone depleting gases, Loss of soil and agricultural land (activities of quarrying and mining, urbanization, road building, civil engineering projects), Loss of forests and natural habitats.

Through construction activities, there are negative effects on the environment like disruption to site ecology, generation of solid and liquid waste, air quality and wind patterns, traffic and transportation, distraction of heritage and culture. Gottfried (1996) opined that one out of six of the world's fresh water bodies and one fourth of wood consumption are caused by demands from construction activities.

2.8 Sustainable construction

To address the environmental and economic consequences of construction, every resource is needed to restore the environment in order to remain profitable in the future (Spence and

Mulligan 1995). This should warrant a change in the way things are done in the construction sector. Hoffman and Henn (2008) define sustainable construction to comprise of strategies, techniques and construction products that reduces the pollution of the environment better than the usual construction methods. It will involve the use of more innovative ways of designing and some changes in the construction process. There should also be the introduction of sustainable materials to replace some of the existing materials where possible. Through sustainable construction, there should also be the incorporation of sustainability objectives in the whole construction process. Material use is very important for a successful sustainable construction process. While encouraging the use of more innovative materials that are environmentally friendly, a conscious effort should be made to ensure ready availability of such materials on the market. This will see to the constant supply and growth of sustainable construction. Major ingredients for sustainable materials include renewability, reuse, constant supply and recycling abilities.

2.9 Implementing sustainable construction

Implementation of sustainable construction demands for proper planning and design. These are very early stages in construction procurement. Getting things right at this very critical stage is very important. This is where sustainable construction strategies are plotted. This requires specialized training and skills because of the complicated nature of sustainable construction designs. Proper knowledge and sources of information on sustainable procurement principles are also important. Furthermore, there should also be a proper coordination of sustainable development goals and objectives with the general organizational objective. They must be consistent with each other. Proper standards should

be put in place with a well established monitoring and evaluation system to check the progress and implementation of sustainable construction strategies. This will measure targets against practices and ensure compliance (UNEP Sustainable Procurement 2008).

2.10 Benefits of sustainable construction in public works

The following has been identified as some of the benefits of sustainable construction:

1. Sustainable construction serves as a solution to the many harmful effects of construction on the environment. Through sustainable procurement practices, some of the otherwise damaging consequences of construction are reduced. For instance, sustainable construction uses materials that can be reused hence reducing the demand for certain raw materials.
2. There is also an improvement of the whole life of projects through sustainable procurement. This is achieved through the use of very environmentally friendly materials in construction works. Such materials last longer and can be applied to other uses in the long term. There are also savings in the disposal of sustainable construction materials with ease and less impact on the environment.
3. Sustainable construction also encourages innovation by industry in response to the demands of the market for sustainability products. Such response will improve economic development of a country due to the establishment of new avenues for job creation. It can also generate foreign exchange through exports of locally manufactured construction materials which has a high market demand globally.

2.11 Sustainable construction principles

There are six main principles suggested by Kibert (2004), university of Florida which are as follows:

- a. Reducing the consumption of resources
- b. Increasing the use of reusable resources
- c. Encouraging renewable and recyclable resource use
- d. Protection of natural habitat
- e. Eradicating toxic environment and an environment that is clean and healthy
- f. Attaining quality in construction projects

These principles however are very bias towards environmental issues. In reference to Bayer (2002), another principle of sustainable building and construction presented by Professor Peter Newman are as follows:

Principle 1: long term economic health

Due to the long life span of construction projects, there is the need to get it right from the beginning because its effects are lasting. All factors that can affect or impact on the environment should be taken very seriously.

Principle 2: Equity and human rights

There should be the assurance of human rights and equality in construction projects. Workers on construction projects should be properly remunerated. Health and safety measures should also be considered so that those accidents are reduced on site. The

countries labor laws should also be followed to reduce worker agitations. A congenial environment should be created for workers to work cordially. Minority interest should also be protected.

Principle 3: biodiversity and ecological integrity

Raw material source are very important in sustainable construction. Sustainable construction considers sources of raw materials that can be replenished and renewed. There should also be measures such as reforestation to restore the vegetation after use. Construction works should be geared at protecting the eco system.

Principle 4: Settlement efficiency and quality of life

Efficiency in the use of resources is essential. Resources like land should be judiciously used to derive maximum benefits. This will create space for future generations in years to come or the foreseeable future. It will in a long way improve on the quality of life of society through less consumption of energy and reduced waste.

Principle 5: Community, regions sense of place and heritage

Integration and a sense of community belonging are very important. Construction activities should consider societal norms and culture. Construction should help encourage a sense of communal involvement and prevent isolation and exclusion.

Principle 6: Net benefit for development

Construction projects should consider economic, social and environmental benefits to society. In developing society through construction, the environment should be protected and left in the best of shapes or better than it was inherited.

Principle 7: Common good for planning

The long term betterment of the community is what sustainable construction seeks to achieve. There should be proper planning with the provision of public services like transport systems and drainage systems in public services.

Principle 8: Integration of the triple bottom line

Evaluation and measurement of success should be based on how the three key bottom lines of social, economic and environmental issues are tackled and achieved.

Principle 9: Precaution

There should be contingency plans to handle issues of emergency. To achieve this, there should be some level of flexibility in the construction cycle to accommodate new issues.

Principle 10: Accountability, transparency and engagement

An extensive engagement of the public on major construction decisions is important. This will generate support for the project and ensure accountability and transparency. It will also encourage inclusiveness and a sense of belonging.

Principle 11: Hope, symbolism and interactive change

A construction project brings hope, serves a symbolic purpose and brings about social and interactive change.

2.12 The challenges to sustainable construction

There have been several constraints that hinder effective implementation of sustainable construction, especially in the developing world. The following challenges have been outlined by the agenda 21 on Sustainable Construction:

2.12.1 Lack of capacity in the construction sector

There is the view that the construction sector lacks the capacity to implement sustainable construction. They lack capacity in terms of personnel, resources, plant and equipment. This is a major challenge to sustainable construction. Construction firms are mostly small and do not have the requisite resources for a successful use of sustainable construction methods. Due to this, they are unable to train personnel to acquire high level skill.

2.12.2 Turbulent economic environment

There is an over dependence on the government for work. Fluctuations in the income generated by governments due to their reliance on multilateral and unilateral financial assistance can be erratic which can have a direct effect on government construction orders. The turbulent economic environment in developing countries creates instability in construction activities which hinder long term investment and does not give room for proper planning which is important in sustainable construction. These constraints include

Government delays in paying contractors for works done and sometimes outright refusal to pay contractors after changes in government which serve as a strain to the finances of contractors.

2.12.3 Poverty and perceived high cost of initial investment

Low income levels and often high perceived initial cost of sustainable materials in developing countries is another major challenge. Citizens and government in developing countries often have low economic power to invest in sustainable construction. They don't usually consider the long term effect of sustainable construction methods through life cycle costing.

2.12.4 Lack of accurate data

There is a general lack of knowledge and data on sustainable construction. There is not enough data to guide patrons on policies and regulations. There is scarce data on sustainable construction materials, methods and where they are available. People ought to secure information on the benefits and effects of sustainable construction as a proof to encourage a change in attitude. Unavailability of critical data on sustainable construction is a big challenge.

2.12.5 Lack of interest in the issue of sustainability

There is also the challenge that not too many people are interested in sustainability issues. Different stakeholders have diverse attitude on sustainability. Politicians are not too interested because sustainability issues are not major issues that translate in significant vote.

Electorates do not consider sustainability issues as key voting issue or link it to bread and butter issues. Manufacturers do not consider sustainability issues in specifications also. There is also a major resistance to change in the construction sector because of the fear of incurring additional cost.

2.12.6 Resistance to technology

Technological dependency is a major hindrance to sustainable construction. People in developing countries are attached to old construction methods and find it very difficult to try new techniques and methods. They find themselves attached to colonial building concepts and building materials such as bricks and reinforced concrete. This might be due to the lack of knowledge and expertise in new methods of sustainable construction. Some of the designs of sustainable construction do not fit into the culture and socio economic settings of many developing countries. There also exist some psychological problems of people looking down on local building technologies that are much more sustainable than foreign products that are not sustainable.

2.13 Sustainable design

Design is the first step towards sustainable construction. Design is an important factor in developing a construction project. This is due to the fact that the designing process involves the integration of a wide variety of considerations about the future (Des Millward et al. 1995). Factors such as durability, usefulness and attractiveness are considered in designing. Sustainable design is an innovative solution to technical problems. A solution considers the impact on the environment, minimizing cost, reducing pollution, use of natural materials and

energy conservation. Sustainable design also means the conception and realization of environmentally sensitive and responsible expression as part of involving matrices of nature (William McDonald and partners, 2000). Design for sustainability implies combining and broadening of three fields: energy consumption in building, waste as a cost and space problems and ecological architecture (Catarina, 2002).

2.14 Components of sustainable construction in design stage

A major part of improving sustainable construction is carefully integrating the design into the whole project. Elements such as location, construction, structure and systems have an effect on each other. Major components for each design stage are as follows:

2.14.1 Site

Creating sustainable construction starts with proper site selection. The first priority is given to reuse or rehabilitating existing structures. Evaluation of the building involves how the building will relate to climatic and weather conditions. Apart from this, direct development to environmentally appropriate areas, maintaining and enhancing the biodiversity and ecology of site can be applied. We also can use native trees, shrubs and plants to achieve sustainable construction (Gottfried, 1996).

2.14.2 Energy

An energy efficient structure can minimize energy cost, increase occupant comfort, provide a healthier living environment, and reduce negative impact on the environment. Apart from this, by reducing energy consumption we can minimize the harmful environmental effects

such as global warming, acid rain, habitat distraction and others. To reduce energy consumption, several strategies can be implemented such as optimizing building placement and configuration for energy performance, use of efficient equipment and appliances and using energy sources with low environmental impact (Gottfried, 1996).

2.14.3 Water

In order to achieve sustainable construction, we must reduce the overall consumption of water. Reducing water use also reduces the requirement for water waste treatment. Some strategies that can be implemented include managing site water, using biological waste treatment systems and conserve building water and cooling water consumption (Gottfried, 1996).

2.14.4 Materials

In order to achieve sustainable construction, selecting materials must achieve these goals. The goals are to minimize consumption and depletion of material resources, minimize the lifecycle impact of materials on indoor environmental quality. To achieve these goals, some strategies such as the use of salvaged and manufactured material cycle, recycle content product materials, materials from renewable sources, locally manufactured materials, durable materials and materials that are reusable, recyclable or biodegradable (Gottfried 1996).

2.14.5 Waste

A construction activity produces a lot of waste. The use of design can remove the production of such waste. To decrease the generation of waste, design also should use salvage and recycle demolishing waste. Recycling construction waste can also help to manage and reduce waste arising from construction.

2.15 Act 663 on sustainable construction

Sustainability is not explicit in the Public Procurement Act 663(2003). The Public Procurement Act is silent on sustainable construction. But in actual sense, achieving value for money which is a major tenet in public procurement is directly in line with promoting sustainable construction. The spirit behind the public procurement act is to ensure value for money. This is amplified in section 2 of the act which states that “the object of the procurement board is to harmonize the processes of public procurement in the public service to secure judicious, economic and efficient use of state resources in public procurement and ensure that public procurement is carried out in a fair, transparent and non discriminatory manner” (Act 663,pg 6). The Act addresses the challenges of sustainability through ensuring there is value for money in the procurement process. i.e. (to ensure that there is judicious, economic and efficient use of resources in the nation). Value for money is a combination of and the balance between the full life cycle costs of a product, service or works at a quality and standard that meet the requirements of the client (KPMG 2014). Value for money can broadly also mean the impact of buying decisions and its effect on social or economic policies, or buying with the long term impact on the environment as a major consideration (UNCDF 2013),. Value for money through life cycle costing includes evaluating the

economic, social and environmental costs and benefits from a procurement decision. In this regard, achieving this objective in the procurement of works will demand the strategic implementation of sustainable construction procurement. Sustainable construction methods will serve as a means to achieve value for money. Value for money can be achieved by providing works procurement needs without compromising the environment, encouraging economic and social development through sustainable construction.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter deals with the methodology used in conducting the research. The chapter focuses on how data was collected and used. Research methodology is a means of carefully finding solutions to the research problem. It defines how a research will be done scientifically. Within a research methodology, we discover the different steps that a researcher employs, research problems, along with the logic behind them (Kothari, 2004). This is a very essential part of a research and serves as a map for solutions to a research problem.

3.2 Design of study

Research design is not just a work plan but it is a tool that enables the researcher to ensure that the evidence obtained answers the questions under investigation in a research, as Unambiguously as possible (De Vaus, 2001). The study made use of descriptive survey, designed to assess sustainable construction in public works procurement in Ghana. A survey research is well suited to descriptive studies of this nature where researchers want to look at relationships between variables occurring in particular real life contexts. A descriptive survey is aimed at describing, observing and documenting aspects of a situation as it naturally occurs rather than explaining them. It is therefore appropriate when a researcher attempts to describe some aspects of a population by selecting unaided, samples of individuals who are asked to complete questionnaires. It is concerned with the conditions or

relationship that exists, such as prevailing practices, conditions and attitudes, processes that are happening, opinions held; or developing trends. Descriptive survey design was an ideal one for this study which seeks to identify practical measures to improve sustainable construction in public works procurement in Ghana. That is examining the state of sustainable construction in public works in order to recommend practical ways of improvement.

3.3 Sources of data

The research made use of both primary and secondary sources of data. Primary data was obtained directly from respondents through the administration of questionnaires. This provided reliable and accurate firsthand information to the study. Secondary data was also obtained from the library, internet, journals, articles, electronic books and research reports. The idea of secondary data was to gather the necessary information to guide the conduct of the study in order to confirm or reject primary data.

3.4 Pre-test

There was a pre testing of questionnaire to check the reliability and validity of the data collection instrument. There was a reconnaissance study in order to pre-test the instruments. This stage revealed the suitability of the methods and instruments that were employed in the study. This helped in the early detection of errors and distortions in the questionnaire which were corrected in the process. It also helped the researcher to familiarize himself with the research environment and also offered the opportunity to practice research in real situation before the main study began (Sarantakos, 1998).

3.5 Data collection instrument

Questionnaire was the main data collection instrument used for this study. Questionnaires provide a tool for eliciting information which one can tabulate and analyze. Questionnaire was appropriate because, it was assumed that, the targeted populations were literates. The questionnaire included both open and close ended questions. The researcher used a purposive and convenience sampling technique in selecting the sample frame. This method was adopted because the researcher deliberately wanted to elicit the views and opinion of key stakeholders in the procurement of public works. It targeted engineers from the works department and procurement officers from the procurement office who influenced public works procurement decisions based on their work experience, academic qualification(Higher National Diploma and above) and influence on public work procurement decisions. Three Municipal assemblies in the Eastern part of Accra were selected based on their proximity. The assemblies were the La Dade Kotopon Municipal Assembly, the La Nkwantanang-Madina Municipal Assembly and the Adentan Municipal Assembly. A total of 45 questionnaires were administered to Procurement officers and engineers from the Works departments. The questionnaires were self-administered. Out of the 45 questionnaires, 39 were returned representing 80%.The data received from returned questionnaires were analyzed using tables categorized into responses, frequency and percentages. Pie charts were also used in some situations.

3.11.1 Relative Importance Index (RII)

The research made use of Relative Importance Index (RII) method to determine the relative importance of each of the challenges and concerns identified. The five-point scale ranged

from 1(strongly disagree) to 5 (strongly agree) was adopted and transformed into relative importance indices (RII) and ranked for each as follows:

$$RII = \frac{\sum W}{A * N}$$

Where

RII = Relative Importance Index

W = is the weighting given to each factor by respondents ranging from (1 to 5)

A = highest weight (i.e. 5 in this case)

N = Total no. of respondents

The RII value had a range from 0 to 1 (0 not inclusive), the higher the value of RII, the more important or frequent was the challenge or concern in promoting sustainable construction.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

4.1 Data presentation and analysis

This chapter presents and analyses data from the research which sought to test the knowledge of respondents on sustainable construction and other key issues such as challenges, benefits and the way forward. The analysis of data is presented in line with the objectives of the study. However, the first section looks at the background of the respondents from whom data for the study was collected.

4.2 Tabulation of Biographic data

Table 4.1: Biographic information

	Frequency	Percent
Current level of education		
Higher national diploma	15	38.5
First degree	24	61.5
Master degree	0	0
Total	39	100
Experience with current organization		
1-5 years	8	20.5
6-10 years	31	79.5
Total	39	100

Source: Authors field survey 2015

All respondents are working with the ministry of local government. They hold varied first degrees and Higher National Diploma with various specializations such as economics and

statistics, marketing, building technology and civil engineering. Their level of experience centered between 1-10 years with 8(20.5%) respondents having less than five years of experience while 31(79.5%) had between 6 to 10 years of experience. Procurement officers had less experience with less than 5 years of experience. The targeted respondents met the criteria for purposively selecting them. They had high level of academic qualification and experience in their various departments.

4.3 Awareness on sustainable construction.

The response to this question was affirmative. The study revealed that respondents were aware of sustainable construction. In all, 39 (100%) of respondents affirmed awareness to sustainable construction. It is clear that respondents are very conscious of sustainable construction issues. When pushed further for their understanding of sustainable construction, respondents answered in varied ways. There was a general principle that permeated all the definitions. The three sustainability themes of economic, social and environmental stewardship were present in all definitions. All respondents exhibited a good understanding of sustainable construction. The level of awareness among respondents was very high. Respondents had acquired knowledge through school and training from the public procurement authority. This will aid the easy implementation of any well defined public procurement policy.

4.4 How knowledge about sustainable construction was acquired.

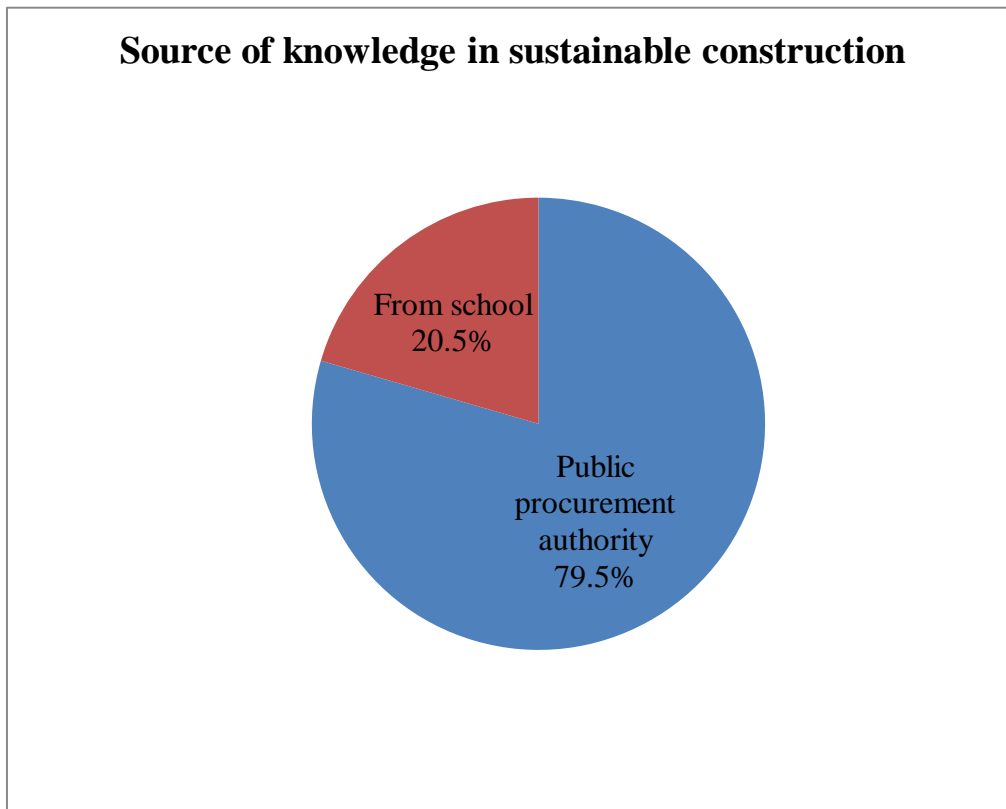


Figure 4.1 Source of knowledge in sustainable construction

The study sought to find out how knowledge on sustainable construction was acquired. It was discovered that 31(79.5%) percent of respondents acquired their knowledge through the Public Procurement Authority and 8(20.5%) from school. Most of the knowledge respondents had on sustainable construction were acquired through training by the public procurement authority. Few respondents acquired their knowledge through their tertiary education. Already, the public procurement authority is sensitizing procurement officials through various training program which has increased the level of knowledge on sustainable construction and this will aid the implementation of any sustainable construction policy.

4.5 Level of awareness in sustainable construction.

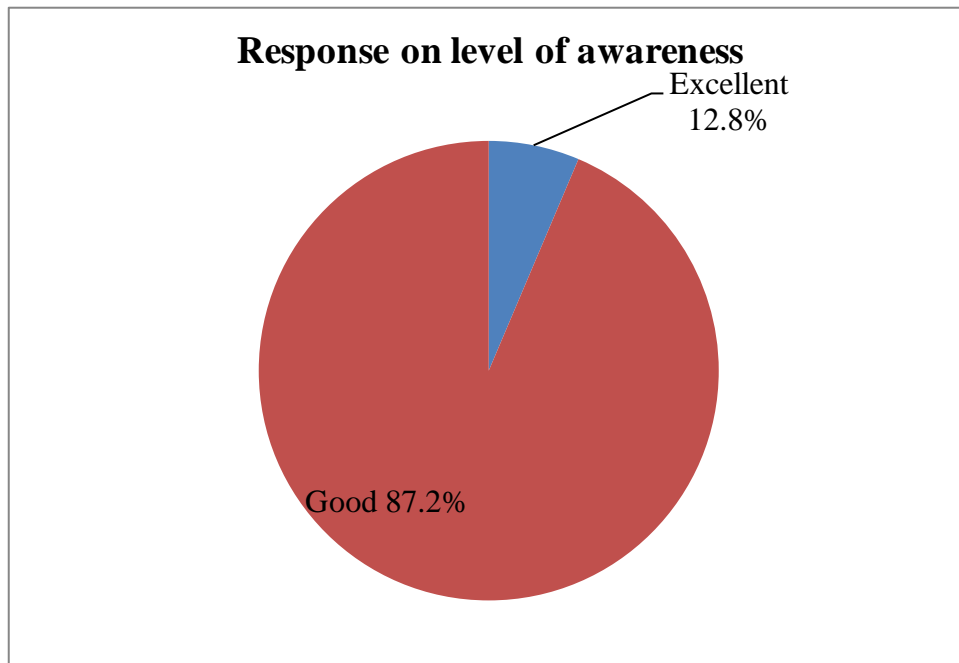


Figure 4.2 level of awareness

Further probe to check the level of awareness in sustainable construction revealed that 34 (87.2%) of respondents had a good level of awareness with 5(12.8%) being excellent. The level of knowledge on sustainable construction is very high and intense based on the findings above. This therefore gives a solid ground preparation for measures to improve on sustainable construction.

4.6 Enough education and training on sustainable construction in Ghana.

When asked whether there is enough education and training on sustainable construction, the response was negative. All respondents agreed that there is not enough education on sustainable construction in Ghana. Despite the effort made by the public procurement

authority and tertiary educational institutions, there is more room for improvement. Further education on sustainable construction methods and technology is required to improve sustainable construction in public works procurement.

4.7 Promotion of sustainable construction using public procurement decisions.

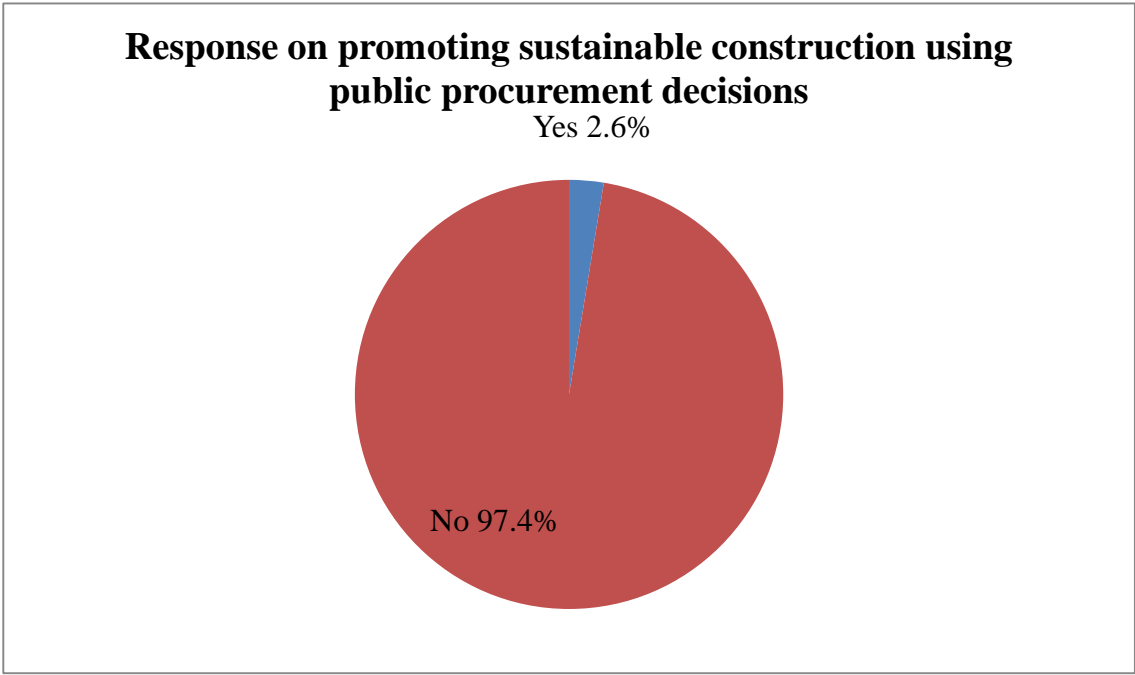


Figure 4.3 Promoting sustainable procurement using public procurement decisions

In promoting sustainable construction through public works procurement decisions, 1(2.6%) of respondents agreed that sustainable construction can be promoted using public procurement decisions. On the other hand, 38(97.4 %) disagreed. one respondent agreed that public procurement decisions will improve sustainable construction. When further asked how, he answered that it will require legislation on all aspects of our building regulations on the importance of sustainable construction. There is a high level of disagreement on using

public procurement decisions to promote sustainable construction. This can be attributed to the lack of legislation on sustainable construction.

4.8 Current statement or policy that commits you to sustainable construction methods in procuring.

Respondents answered negatively to whether there was a policy or statement that commits officials to sustainable construction methods. All (100%) agreed there is no policy on sustainable construction methods. They indicated that there is not a clear cut policy on sustainable construction methods in the Procurement Act. That is there was no compulsion in the implementation of sustainable construction methods because it is not clearly stated in the Procurement Act. Even though there is great awareness and knowledge on sustainable construction, the lack of regulatory policy and legal backing, does not encourage the practical application of knowledge on sustainable construction. There is no law to guide procurement officials or punish them when they go wrong and this is a major hindrance to promoting sustainable construction in public works procurement.

4.9 Procurement cycle stage for considering Sustainability issues.

According to respondents, the design stage is where sustainability issues are considered most. All (100%) respondent agreed that the design stage formed the basis for considering any sustainability issue. This is where decisions about drawing and specifications are made in the procurement process. The design stage is the key stage in works procurement where sustainable construction considerations such as durability, usefulness and attractiveness will

be considered. Sustainable construction design components such as site, energy, water, materials and waste are also given great consideration at this stage.

Table 4.2 Sustainable construction issues ever considered and issues considered most.

Sustainable construction issues ever considered	Frequency	Percent
Energy wastage	20	30
Deforestation	22	33
Economic development of society	25	37
Total	67	100.0
Issues considered most		
Economic	10	25.6
Social	9	23.1
environmental	20	51.3
Total	39	100

Source: Authors field survey 2015

4.10 Sustainable construction issues organization consider most in your operation.

From table 4.2 above, respondents consider mostly issues of energy wastage, deforestation and economic development of the society in their operations. However, economic development of the society was considered often with 25(37%), followed by energy wastage 20(30%) and deforestation 22(33%). It can also be inferred from the table that environmental issues are considered most frequently with the combination of energy wastage and deforestation whilst economic development of the society is considered less. Correspondents have one occasion or the other considered a sustainable construction issue in their procurement decision. Such a consideration will help proper disposal of waste, reduce

energy consumption and promote human security which will be very beneficial to the society. These issues will also help achieve sustainability themes of social progress, economic development and environmental stewardship.

4.11 Some of the sustainability issues that you have ever considered in your outfit.

Based on table 4.2 above, environmental sustainability issues were given more prominence than the others with 20(51.3%) considerations. Other issues like economic came second with 10 (25.6%)whiles social issues were considered the least with 9(23.1%).This is contrary to the general believe that developing countries concentrate less on environmental sustainability issues but more on social and economic factors. These issues are very much linked with the sustainability concerns of energy wastage, economic development and deforestation.

4.12 The extent Procurement officials make Sustainability decisions.

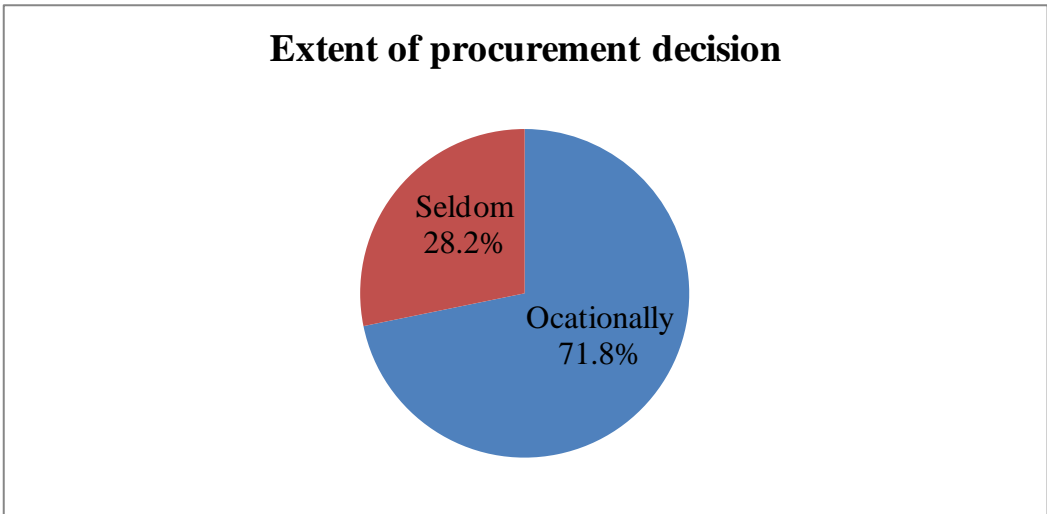


Figure 4.4 Extent procurement officials make sustainable decision

In responding to the extent procurement officials make sustainable procurement decisions, 28(71.8%) of respondents occasionally make sustainability decisions, while 11(28.3%) respondents seldom considered sustainability issues in their decision. Sustainable construction decisions are considered more often than not. It came to the fore that sustainable construction decisions are hardly taken. It is considered once in a while when necessary but not all the time. This is because of its non compulsion nature and can also be attributed to the lack of legal backing.

4.13 Widespread Knowledge on Sustainable construction in Ghana.

Respondents disagreed that there was widespread knowledge of sustainable construction. None of the respondents agreed to the statement that there is widespread knowledge of sustainable construction in Ghana. Knowledge among procurement officials is high but not across other departments which are not directly involved with procurement decisions. Support is needed from other department who are also beneficiaries of procurement decisions.

4.14 Tabulation of responses to the Challenges affecting Sustainable construction in Ghana.

The tables bellow deals with the challenges of sustainable construction.

Table 4.3 Challenges

Challenges	Responses					RII		
	1	2	3	4	5	Weight	RII	Rank
Lack of public awareness	0	0	0	128	35	163	0.836	1 th
Lack of interest in the issues of sustainability	0	0	6	128	25	159	0.815	2 th
Poverty and perceived high cost of initial investment	0	2	3	128	25	158	0.810	3 rd
Lack of research into sustainable construction	0	8	9	120	10	147	0.754	4 th
Lack of capacity of the construction sector	0	12	6	112	15	145	0.744	5 nd
Little incentive for procurement officers	0	6	27	108	0	141	0.723	6 th
Resistance to technology	0	20	15	96	0	131	0.672	7 st
Turbulent economic environment	0	48	15	40	0	103	0.528	8 th
Lack of accurate data	0	52	12	36	0	100	0.513	9 th

Source: Authors Field Survey, 2015

Rank: [5-Strongly agree, 4-Agree, 3-neutral, 2-Disagree, 1-Strongly Disagree]

This section sought to measure the extent of agreement by respondents to the challenges of sustainable construction in the literature review. It aimed at establishing whether the procurement practitioners could identify with those challenges. Respondents identified with the following challenges (1) lack of public awareness, (2).lack of interest in the issue of

sustainability, (3).poverty and perceived high cost of initial investment (4).lack of research into sustainable construction (5).lack of capacity of the construction sector (6).little incentive for procurement officers (7).resistance to technology (8).turbulent economic environment (9).lack of accurate data. According to the ranking above, the top three challenges of sustainable construction are Lack of public awareness, lack of interest in sustainability issues with poverty and perceived high cost of initial investment. Lack of public awareness was ranked highest and was identified by respondents as the major challenge in promoting sustainable construction. It was ranked 1st among the other challenges. They least identified with lack of accurate data as a challenge. This goes to buttress the point that even though the level of knowledge on sustainable construction is high among procurement officials, it is not widespread especially among non procurement officials. Other challenges respondents identified with has been ranked in table 4.3 above.

4.15 Tabulation of Measures undertaken to mitigate this / these challenges.

Table 4.4 Measures against challenges

Response	Frequency	Percent
Education to adopt to situation	39	86.7
Vegetation reforestation	6	13.3
Total	45	100

Source: Authors field survey 2015

Two key issues were dominant as measures taken by procurement officials to mitigate the challenges of sustainable construction. These issues were education to adapt to situation and vegetation restoration. Most respondents undertook education to adapt to situation with

86.7% as a way of mitigating the challenges of sustainable construction, while Vegetation reforestation was also used with (13.3%). In other words, stakeholder sensitization was done mostly along with vegetation reclamation. This is to whip up public support, understanding and interest.

4.16 Tabulation of Primary sustainable construction concern in connection with operations.

Table 4.5 sustainability concerns

Factors	Responses					RII		
	1	2	3	4	5	Weight	RII	Rank
Disposal of waste or by products	0	5	3	22	9	152	0.779	1 st
How to save power or electricity	0	10	1	17	11	146	0.749	2 nd
How to conserve water	0	8	15	8	8	133	0.682	4 th
Safety at work place	0	7	4	21	7	145	0.744	3 rd
How to stimulate local economy	0	0	26	11	2	132	0.677	5 th
How to conserve wildlife	0	1	27	7	4	131	0.672	6 th

Source: Authors Field Survey, 2015

Rank: [5-Strongly agree, 4-Agree, 3-Neutral, 2-Disagree, 1-Strongly Disagree]

This section assesses the primary issues which were considered by procurement officials in connection with their operations. It sought the agreement or disagreement of respondents to some key considerations in sustainable construction and considered which of the measures were considered most. Disposal of waste appeared to be the key issue considered most by procurement officials with a relative importance index (RII) of (0.779). The least considered issue however was conservation of wild life with a relative importance index (RII) of

(0.672). This can be attributed to the urban nature the municipal assemblies. Furthermore, socio-economic issues had a low relative importance index (RII) of (0.677) in 5th place which is contrary to the U.N.D.P guideline on sustainable procurement policy, which suggest that developing countries turn to concentrate more on socio-economic issues than the environment. It should be noted that all these concerns are considered in the design stage of the procurement process. Sustainability concerns are also in tune with sustainable construction principles outlined by Kibert and Buyer which forms the basis for any strategy to promote sustainable construction.

4.17 Visible benefits of sustainable construction in the construction of public works

Without any reservations, respondents agreed that there are some visible befits that sustainable construction practices can bring to the society. All respondents answered yes to the question of whether there are some visible benefits to the practice of sustainable construction. This indicates their level of commitment and attachment to sustainable construction. The adoption of sustainable construction practices will help reduce the adverse effects of construction on the environment, reduce cost by improving on the whole life cycle of a project and generate wealth through innovation and investment in new technology and avenue for job creation.

CHAPTER FIVE

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses the findings of the research with recommendations and draws conclusions based on the findings. This study is geared towards the objective of assessing the level of knowledge of procurement practitioners on sustainable construction, identifying challenges in the use of sustainable construction in the procurement of Public works and to suggest practical measures to improve sustainable construction at key stages in works procurement.

FINDINGS

5.2 Assessing knowledge on sustainable construction

1. Officials have appreciable knowledge on sustainable construction but there is the need to do more. Respondents also confirmed that there is not enough training on sustainable construction in public works procurement. Even though there have been some efforts in that direction more needed to be done.

2. Consideration of primary sustainable construction principles will in a long term bring some benefit to society. Proper disposal of waste will help solve sanitation problems in the country, Power saving considerations will help reduce electricity consumption and reduce the burden on electricity generation in the country, safety at workplace will ensure human security and reduce accidents on site whiles stimulating the local

economy will generate employment and create wealth. Conserving wildlife will also help improve the ecosystem and reduce the impact of construction on other life forms. These principles form the basis for any strategy to promote sustainable construction such as the use of bio gas and water improvement systems. All these come under the ambit of the primary sustainability themes of social, economic and environmental stewardship.

3. Environmental issues are considered most before the other themes of economic and social considerations. This is due to the fact that despite the absence of specific provisions in the procurement act, there are other laws that regulate construction works which are environmental in nature.

5.3 Challenges and measures for improving sustainable construction

1. It was also identified that some key personnel in procurement decision making positions lack the experience and the expertise. Most often do not have formal education or certificate in procurement. There are key procurement officials holding degrees in economics, planning, marketing and sociology with little working experience of less than three years.
2. There are no clear provisions on sustainable construction in the public procurement Act (Act 663), to guide practitioners in their actions. This does not compel and motivate procurement practitioners to consider sustainability considerations in the procurement of public works. The absence of a direct policy on sustainable

construction has led to some occasional use of sustainable construction methods and this serves as a disincentive for procurement officers to implement sustainable construction methods.

3. Chronologically challenges of (1) lack of public awareness, (2).lack of interest in the issue of sustainability, (3).poverty and perceived high cost of initial investment (4).lack of research into sustainable construction (5).lack of capacity of the construction sector (6).little incentive for procurement officers (7).resistance to technology (8).turbulent economic environment (9).lack of accurate data, are the major challenges of sustainable construction in public works procurement.

5.4 Conclusion

In conclusion the study indicated that knowledge on sustainable construction in public works procurement is widespread among procurement practitioners. But the lack of clear legal and regulatory framework for implementation has made its implementation and practice not compelling. This has led to sometime occasional use of sustainable construction procurement practices in the procurement of public works. To achieve a more visible benefit, will mean an amendment in the existing legislation (Act 663) or a clear policy on sustainable construction. To ensure effective use of measures in promoting sustainable construction, it must be backed by law.

5.5 Recommendations

1. A sustainable construction action plan with well defined targets and strategies such as reducing waste, carbon emissions, energy and water consumption, delivering social benefits through procurement should be put in place. This action plan will include various strategies and measures such as using sustainable materials, energy efficient technology, buying raw materials like timber from sustainable sources and the use of labor based construction techniques which will create employment. This will encourage participation of local enterprises and achieve economic and social objectives of sustainable construction.
2. There should also be an intensification of education to the general public by the Public Procurement Authority on sustainable construction methods. The general population should be sensitized on the opportunities and benefits derived from sustainable construction methods. This will increase their interest on sustainability issues and will result in providing support for public institutions in their construction activities and demand for accountability. This is a sure way to improve sustainable procurement in public works procurement.
3. To improve on sustainable construction practices, I also recommend an amendment to the procurement laws by Government to include more clearly, sections on sustainable procurement practices. Such a law will compel procurement practitioners to be more proactive with sustainable construction issues. The law will streamline procurement procedures at the critical stage of sourcing with designs, drawings and

specifications which will factor in issues like durability, usefulness and attractiveness. A clear policy on sustainable procurement and sustainable construction for that matter will establish expectations in the procurement function supported by processes which will identify means and measures of achieving such goals. For smooth implementation of sustainable construction, policies and processes should be supported by top hierarchy of government.

4. I also suggest a high investment in sustainable construction research. Government, the private sector industries and academia should invest in sustainable construction machinery, equipment, training and research. This will improve the knowledge on sustainable construction materials, technology and methods as a measure to improve sustainable procurement in public works procurement. The linkage between research and procurement practitioners will help in this regard.
5. To improve on sustainable construction through public works procurement, sustainable construction principles should be of major consideration at key stages of work procurement. The design stage of works procurement is where sustainable construction issues are mostly considered. It is therefore critical that principles such as reducing the consumption of resources, increasing the use of reusable resources, protection of the natural habitat and attaining quality in construction projects will be factored into the choice of design. Other principles such as the long term economic wealth, human rights and equity, efficiency of settlement and quality of life and the general integration of the triple bottom line pillars of social, economic and environmental issues are tackled and achieved at this critical stage. This can be done

through the choice of materials and methods used. Inclusion of sustainable construction criteria at a critical stage of design in public works procurement will create an enabling environment for sustainable construction to thrive and develop a market for sustainable construction materials and products.

6. Reducing energy consumption through the use of alternative energy sources such as bio gas systems and passive solar design improvement with redesigning of appliances such as water heaters and lighting sources can improve on sustainable construction. Water user education in water consumption and energy use can also help.

5.6 Recommendation for future research

- I believe there should be future research that is much more extensive which will cover more municipal assemblies in other regions of Ghana.
- Further research should also be done on the extent of market readiness for sustainable construction in Ghana.
- There should also be research into the use of local building technologies to improve sustainable construction in Ghana.

REFERENCES

- Aurora Energy, (2008). “*Principles of Sustainable Procurement, Policy and procedure statement*” Vol 3, United Kingdom. pp. 1-11.
- Bayer, D.(2002),Sustainable Building and Construction ,Bachelor Degree thesis. Murdock University
- Bristol City council (2006) *Supplementary Planning Document Number 5, Development framework, sustainable Building Design and Construction*. www.bristol-city.gov.uk/sustainabledevelopment (Accessed:17/06/2015)
- Catarina, T.(2002) *Recycling Potential and Design For Disassembly in Building* ,Department of Building and Architecture, Lund institute of Technology.
- BRE Environmental Consultancy (2008), *sustainable construction – simple Ways to make it happen*, IHS BRE Press, London.
- Chartered Institute of Purchasing & Supply (2011), *CIPS Sustainable procurement review*, CIPS, United Kingdom.
- Chartered Institute of Purchasing and Supply, knowledge works (2009), *sustainable procurement*, CIPS, United Kingdom.
- De Vaus, D. (2001) *Research design in social research*. Sage Publications Ltd, London.
- Du Plessis, C. (2002), *Agenda 21 for Sustainable Construction in Developing Countries A discussion document*, Capture Press, Pretoria.
- Des Milward et al (1995). *Construction and Built Environment*, Longman. GNVQ.

- European Union (2011), *Buying green, a handbook on green public procurement*, 2nd Edition. Printed in Belgium.
- Fissena, T. Kaarim, T. Bethge, J.(2005),*Sustainable Building and Construction in Africa*, Federal Ministry for the Environment, Nature Construction and Nuclear Supply(BMN),Berlin-Mitte.
- Ghana, *Public Procurement Act 663*(2003), Section 2,Government printer, Assembly Press Accra, pp 6.
- Gottfried.(1996).*Sustainable Building Technical Manual, Green Building Design Construction And Operation*, Public Technology Inc. United States of America.
- Good Practice Guidance (2012), *Sustainable Design and Construction, Cross Sector Group on Sustainable Design and Construction*.
- Hoffman, A.J. and Henn, R. (2008) *Overcoming the social and psychological barriers to green building. Organization & Environment*, **21**(4), pp. 390-419
- Kibert, C.J (2004), *Journal of Sand Use and Environmental Law*, Florida State University.
- KPMG Romania (2014), *Value for Money in Public Procurement*, www.kpmg.ro.(Accessed:5/06/2015)
- Kothari, C.R. (2004), *Research Methodology, Methods and Techniques*. 2nd edition .New Age International (P) Ltd.
- Langston, C. and Ding, G. (2004), *Multiple Criteria Sustainability Modeling, Case study on School Buildings*, University of Technology, Sydney ,Deakin university school of Architecture, Water Front.

Lui, D. (1999), *Environmental engineers hand book*, CRS net base, Chapman and Hall, London.

Green Building Tips and Techniques (2006), Marion County Public Works - Environmental Services <http://publicworks.co.marion.or.us/es/>, (Accessed:05/06/2015)

Malik M. A.(2002).*Sustainable development and sustainable construction: a literature review on C- scan D project*, department of civil engineering. Lough borough university.

Miyatake, Y.(1996),*Technology Development and Sustainable Construction*. Journal on management in engineering, pp. 23-27.

Pulaski, M. (2004), *Field Guide for Sustainable Construction*, The Partnership for Achieving Construction Excellence, The Pennsylvania State University.

Procuring the Future Sustainable Procurement National Action Plan (2006) Recommendations from the Sustainable Procurement Task Force, Department for Environment, Food and Rural Affairs United Kingdom.

Queensland Government Chief Procurement Office, (2006), *Procurement Guidance Material, Integrating sustainability into the procurement process*. Department of Public Works, Queensland.

Schoenberg, J. M. (2012), *A Case Study Approach to Identifying the Constraints and Barriers to Design Innovation for Modular Construction*, Msc thesis In Architecture

Simon & Semple, Galvin & Rudin and Tisch, A. (2012) , *Procuring innovative and sustainable construction ,a guide for European Public authorities*. Sci-network Project Publication. Druckerei Kesselring GMBH, Freiburg.

Sarantakos, D. (1998). *Social Research* (2nd Edition). London MacMillan Press Ltd

Sustainable procurement Guidelines (2009), *Users Guide, Developed by Local Governments for Sustainability (ICLEI) for the United Nations Environmental program*, - Division of Technology, Industry and Economics(UNEP-DTIE), UNEP-DTIE, 15 rue de Milan.

Spence, R. and Mulligan, H.(1995) *Sustainable Development and the Construction industry*, Cambridge Architecture Research Limited UK. Esevier Ltd.

Tunnel visions on sustainability (2014), *Sustainability aspects and its selection process for road tunnel construction projects*, Msc Thesis report Darinde Jolijn Gijzel Rotterdam, June 2014 , Delft University of technology.

UNEP Sustainable Procurement (2008). *Buying for a Better World, the United Nations Sustainable Procurement Guide*, UNEP's Division of Technology, Industry and Economics, Paris.

UNDP practice series (2008), *Environmental Procurement, practice guide*, vol. 1. ISO 9001/ISO 14001/OHSAS 18001 certified. Phoenix Design Aid A/S, Denmark.

UNCDF(2013),*Procurement for local development, a guide to best practice in local government procurement in least developed countries*, advance printing service company limited, New York.

Uttam, K. (2014) *Seeking sustainability in the construction sector: opportunities within impact assessment and sustainable public procurement*. PhD Thesis, TRITA LWR PHD 2014:03

University of Southampton (2006), *Policy on Sustainable Construction*.
www.southampton.gov.uk.(Accessed:13/06/2015)

Wahlstrom, P. Suer, P. and Butera, S. (2014), *Environmentally Sustainable Construction Products and Materials-Assessment of release and Emissions*, Nordick innovation publication, Oslo.

William McDonough and Partners (2000).*The Hannover Principles, Design for Sustainability*, expo 2000, The World Fair. Hannover, Germany.

Yusra, M. Bryde, D. and Al-Shaer, M. (2014), *The Role of Real Estate in Sustainable Development in Developing Countries: The Case of the Kingdom of Bahrain*, open access article ISSN 2071-1050
www.mdpi.com/journal/sustainability.(Accessed13/06/2015)

Zero waste Scotland (2001), *Sustainable Procurement in Scotland - A Collection of Case Studies*, www.zerowastescotland.org.uk.(Accessed:13/06/2015)

Appendix

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY



COLLEGE OF ARCHITECTURE AND PLANNING

DEPARTMENT OF BUILDING TECHNOLOGY.

Introduction: Thank you for agreeing to participate in this study. I am a Postgraduate student at the KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY reading a program leading to the award of Msc. PROCUREMENT MANAGEMENT.

I am carrying out a project on the topic: “AN EXPLORATORY STUDY INTO PROMOTING SUSTAINABLE CONSTRUCTION IN GHANA, THROUGH PUBLIC WORKS PROCUREMENT”.

Please be assured that all the information collected will be kept confidential and that your names and identifiable indicators will never be shown to any other party or for any other purpose other than for its academic purpose.

This survey is aimed at seeking practical measures to improve sustainable construction through public works procurement in Ghana. This will in the long term reduce the negative impact of construction on development and rather increase the positive impact. The questionnaire is in two parts: Personal data and Sustainable construction / Sustainability.

SECTION A. BIO-DATA

1. Please indicate your sector ministry/department
 - a) ministry of local government ()
 - b) ministry of works and housing ()
 - c) ministry of roads and highways ()
2. What is your qualification?
 - a) Masters /postgraduate () specify the field of Specialization.....
 - b) Bachelors () specify the field of Specialization.....
 - c) HND () specify the field of Specialization.....
 - d) SSCE ()
 - e) Other ()
3. Please indicate your years of experience in the procurement of works.
 - a) 0-5yrs () b). 6-10yrs () c). 11-15yrs () d). 16yrs and above ()

SECTION B: SUSTAINABLE CONSTRUCTION AND SUSTAINABILITY

4. Are you aware of sustainable construction? A. Yes () B. No ()
5. If yes, how did you know about sustainable construction? Please tick as many as may apply.
 - b) From colleagues ()
 - c) From the news paper or internet ()
 - d) From public procurement authority ()
 - e) From school ()
6. What is your level of awareness in sustainable construction?
 - a. Poor () b. Fair () c. Good () d. Excellent ()

7. Please what is your understanding of Sustainable construction in public works procurement?
-
-
8. Do you think there is enough education and training on sustainable construction in Ghana? A. Yes () B. No ()
9. Can sustainable construction be promoted using public procurement decisions?
- a. Yes () b. No ()
10. If yes to Q 12, how?
-
-
11. Is there a current statement or policy that commits you to sustainable construction methods in procuring? A. Yes () B. No ()
12. At what procurement cycle stage do you consider Sustainability issues?
- a) Sourcing Stage () b) Tender Evaluation Stage ()
13. What sustainability issues does your organization consider most in your operation?
- a). Economic () b). social () c). environmental ()
14. What is/are some of the sustainable construction issues that you have ever considered in your outfit? Please tick as many as may apply.
- a. Energy Wastage ()
- b. Water pollution ()
- c. Air Pollution ()
- d. Deforestation ()

- e. Destruction of Life forms ()
- f. Protection Of endangered Species ()
- g. Economic development of the society ()
- h. Promotion of minority interest (women and disabled) ()

15. In your opinion, to what extent do Procurement officials make Sustainability decisions?

- a. Very frequent ()
- b. Frequent ()
- c. Occasionally ()
- d. Seldom ()
- e. Never ()

16. Knowledge on Sustainable construction is widespread in Ghana.

- a. Strongly Agree ()
- b. Agree ()
- c. Neutral ()
- d. Disagree ()
- e. Strongly disagree ()

17. Indicate which of the under listed Challenges affect Sustainable construction in Ghana?

	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
Lack of capacity of the construction sector					
Turbulent economic environment					
Poverty and perceived high cost of initial investment					
Lack of accurate data					
Lack of interest in the issue of sustainability					
Resistance to technology					
Lack of public awareness					
Lack of research into sustainable construction					
Little incentive for procurement officers					
Others					

18. If others, please indicate below.

.....

19. What measures does your outfit undertake to mitigate this / these challenges? Please tick as many as may apply.

- a. Education to adapt to situation ()
- b. Research and development to find better ways ()
- c. Compensation ()
- d. Vegetation Restoration ()
- e. others ()

20. Please specify below if others.

.....

21. What does your outfit consider as a primary sustainable construction concern in connection with its operations?

	Strongly disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
Disposal of waste or by products					
How to save Power or electricity					
How to conserve water					
Safety at work place					
How to stimulate local economy					
How to conserve wildlife					

22. Do you think sustainable construction can bring any visible benefits in the construction of public works? a. Yes () b. No ()