KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI, GHANA

FACULTY OF ART AND BUILT ENVIRONMENT

DEPARTMENT OF BUILDING TECHNOLOGY

SUSTAINABILITY OF BUILDING FINISHES IN THE GHANAIAN REAL ESTATE SECTOR.

BY:

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KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI, GHANA

Studies on Sustainability and Building Finishes in the Ghanaian Real Estate Sector

By

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A thesis submitted to the Department of Building Technology,
College of Built Environment
In partial fulfilment of the requirement for the degree of

MASTER OF SCIENCE

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DECLARATION

I hereby declare that this submission is my own work toward the award of Master of Science Degree in Construction 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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(Head of Department)

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Date

ABSTRACT

Globally, the real Estate industry utilizes 50% of all materials extracted from the earth's crust. The measure and complexity of our requirements for natural resources have increased greatly with the rising levels of population and production. Utilization of these natural resources have adverse effects on the ecosystem, as a result there is a need to take responsibility for the effect of real estate activities on economy, society and the environment, and appropriate measures taken to address them. However, the real estate sector in Ghana uses mostly 'wet' applied finishes such as Paints and Tiles that are imported in most cases. Most of the imported building finishing inputs which are always used by real estate developers can easily be exchanged with local ones with same functionality and durability. This research explored critical factors considered in the selection of building finishing materials and identify barriers to sustainable considerations during the selection of building finishes in the Ghanaian real estate sector. Given the degree of accuracy of facts required and factors to be analyzed in this study, the researcher addressed how the data were collected and evaluated by using a well-structured Questionnaires. They were coded and analyzed using relative importance index. The research brought to bear the fact that, sustainability has not been fully embraced by companies in the Real Estate Sector of Ghana. Some key industry players do not even consider it at all in their quest to achieve their organizations goal of housing Ghanaians. Aesthetics, initial cost, and availability of material is a critical factor considered by key personnel in the Real Estate Sector during the selection of building finishing material. Secondly market trends, availability of green rating data, and perceive increased cost are the major barriers to making green choices and Value for money is key to every company in their endeavour. The researcher recommends that a comparative cost analysis be carried

out for alternative sustainable building finishing materials and the results published to alleviate doughts of perceived increased cost. Professional bodies should organize seminars for their members on the sustainability agenda in order to bring the Ghanaian professional up to speed about global action on sustainability.

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DEDICATION

This work is dedicated to the Glory of God almighty in whom I move and have my being.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

It is very obvious the world's population is fast growing. Berry and McCarthy (2011) estimated that the world's population will double in the next 40 years, this may sound like a very good news for the housing sector because all those extra people will need places to lay their head. Globally, the real Estate industry utilizes 50% of all materials extracted from the earth's crust (Shakantu et al., 2007). Utilization of these natural resources have adverse effects on the ecosystem, as a result there is a need to take responsibility for the effect the real estate sector have on society and the environment, and appropriate measure taken to address those issues.

The Brundtland (1987) report on survival set a great stage for the rational utilization of mother nature's provisions. The measure and intricacy of demand for resources provided by nature have risen immensely due to escalating dimensions of population and reproduction over the years. Natural resource can be viewed as limitless, but it is also delicate and well-adjusted. There are limits that cannot be exceeded, when crossed there will be a total collapse of the ecosystem hence jeopardising with the existence of life on the planet earth. Today we are almost at these thresholds; we must be ever careful of the risk of compromising the existence of life on Earth. Above all, the rate with which transformations are taking place gives little time in which to forestall and prevent unforeseen disaster. As a result of the finite resources of the planet, there has been growing concerns about its ability to cope with the negative effects of the growth of human population and their practices on these resources. As a result, there is the need for an

intervention to control the alarming rate of depletion of the earth's resources (Living Planet Report 2008, 2010).

Ghana Statistical Service in 2014, show the decreased contribution of the real estate sector in Ghana to Gross Domestic Product (GDP), in 2014 was 3.6% compared to 5.1% in 2006. This shows a marginal decrease in the contribution of the real estate sector to the Ghanaian economy by -1.5% within the last eight years. Therefore, it is very imperative that best practices are adopted in providing Sustainable houses in order that we can also enjoy the economic benefits offered by this sector like in other parts of the world.

Shelter is an essential issue in every political regime's policy in Ghana since the early 21st century and prior to the emergence of the first republic, the relevance of general habitable infrastructure development to economic progress was acknowledge (UN-Habitat, 2001).

The generic definition of a house is a structure to provide shelter needs. However, in a fast developing country such as Ghana, housing has gone beyond just shelter. Home are no longer mere shelter providing objects, but goes beyond that to reflect the state of security one has, person's standard of living due to amenities available and one's social class due to the level of finishing. Building finishes which can best be likened to the package of the building as a product should therefore be presented in such a manner that depicts the status of the facility being delivered by the Real Estate Companies.

Anecdotal evidence shows that adaptation of the natural environment for human habitation with all its emerging sophistication in finishes cannot be achieved without the use of natural resources. In attempt to addressing this paramount issue of housing, Sustainability cannot be ignored.

1.2 STATEMENT OF THE PROBLEM

The real estate sector consumes forty percent (40%) of the world's quarry products, and fine aggregate. A quarter (25%) of forestry timber, consumes forty percent (40%) of global energy requirements and Sixteen percent (16%) of portable water yearly (Ding, 2004; Horvath, 2004) an anticipated radical change in global population from Six and a half (6.5) billion to an estimated 9 billion in the next three decades (Fernández-Solís, 2008) illustrates the harshness of the looming danger. Depletion of Nature's provisions as an outcome of eventual surge in Real Estate development endeavours.

Research also has it that by 2056, world-wide economic activity will have enlarged five fold; world-wide population will be fifty percent more (50%) more; global energy usage will have tripled and international manufacturing activity will have increased not less than three times (Akadiri, 2015).

In modern construction practice for mass housing, the technology of finishing work has changed substantially (Merriam et al., 1987). There is a surge in the use of large manufactured units, buildings, and parts that are delivered to the building site in final finished form for example, dry wall sheets and roofs, sanitary wares, window and door units. This significantly curtails the after assembly finishing work. Technology has also enhanced the production of an array of good finishing materials that enables the possibility of eliminating the most arduous and time wasting procedures (the "wet" processes) and to enhance the sustainability of building finishes. Sheets of bamboo, facing slabs, plastic shingles and water-resistant wallpaper are common in other part of the world.

However, the real estate sector in Ghana uses mostly 'wet' applied finishes such as Paints and Tiles that are imported in most cases. Most of the imported building finishing inputs

which are always used by real estate developers can easily be exchanged with local ones with same functionality and durability. The open market in Ghana is besieged with low quality imported building supplies which may not be as robust as home- produced counterparts and there is an extensive list of high-quality building materials, primarily from BRRI in Kumasi, but most of them have been shelved and few have passed into commercial use in the real estate industry (UN Habitat, 2001).

1.3 AIM AND OBJECTIVES

1.3.1 AIM

The study explored the subject of sustainability considerations during the selection of building finishes in the Ghanaian real estate sector.

1.3.2 OBJECTIVES

The core objectives of this research were:

1. To identify the factors considered by companies in the choice of building finishes they use;
2. To identify the barriers to making 'Green' sustainable choices in the selection of building finishes; and
3. To evaluate to what extent identified benefits of sustainability affect the choice of finishes.

1.4 RESEARCH QUESTIONS

In effort to realize the objective of this research, the researcher will endeavour to find responses to the following questions:

i. What is the level of awareness about Sustainable building finishes?

ii. What factors are considered by key personnel in Real Estate Sector in selecting Building Finishes?

iii. What are the barrier to making sustainable choices in the selection of building finishes?

1.5 SIGNIFICANCE OF STUDY

According to a recent World Economic Forum Report, the Real Estate sector consumes over 40% of global raw material and energy annually. Ghana Statistical Service in 2014, shows the decrease contribution of the real estate sector in Ghana to Gross Domestic Product (GDP), in 2014 was 3.6% compared to 5.1% in 2006. This shows a marginal decrease in the contribution of the real estate sector to the Ghanaian economy by -1.5% within the last eight years. Therefore, it is very imperative that best practices are adopted in providing Sustainable houses in order that we can also enjoy the economic benefits offered by this sector like in other parts of the world, if this is not done we may be doubling our owes since housing development have detrimental effects on the environment and social aspects of life.

1.6 SCOPE

This research zero-in on the sustainability of building finishes in house produces by real Estate Companies. Geographically, only Real Estate companies in the Greater Accra Region were surveyed. In that, this is where firms are concentrated in the country. It is much convenient to interact and gather information from key project Personnel. Firms that were surveyed are Ghana Real Estate Developers Association (GREDA) member in good standing as at June 2016.

1.7 BRIEF METHODOLOGY

This section studied methods and selected the method by which the researcher achieved the objectives of the study. The discussion here borders on issues such as research design, population and sampling technique, research data sources, data collection instrument and how the data gathered was analysed.

The Researcher employed survey as the style for the study. This is a commonly the research method for most quantitative research and very efficient if there is the need to find small amounts of information from a wider selection of people in the anticipations of making a universal assertion (Driscoll, 2011). 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.

The way research data is analyzed and interpreted is very essential to all survey works. Neuman (2007) is of the view that the technique of analysis is very important to any research approach. Several strategies can actually be used in probing, sorting, organizing and or having an amalgamation of the facts to deal with the research questions. Given the degree of accuracy facts required and factors to be analyzed in this study, a well-structured questionnaire were used to collect data in order to forestall difficulty in evaluating primary Data. Questionnaire were coded and analysed with Statistical Package for Social Scientist version 20.0 (SPSS 20.0) using relative importance index.

1.8 STRUCTURE OF REPORT

The Researcher in quest to present a well-structured dissertation organised the report in to five main Chapters. Every chapter uniquely tackle a separate aspect of the research as follows:

Chapter one dealt with the overall introduction and background to the research, making plain the problem at hand, research aim and objectives, stating explicitly research questions, and significance of the research, and finally considers the scope, and structure of the research report.

The second chapter reviewed literature of the research, touching on Generic Definitions, theories and concepts of Sustainability and Building finishes. The Real Estate Industry in Ghana, In-depth look at some Sustainable alternatives of building finishes.

Chapter three emphasised on the study methodology in terms of research approach and design, research population, sampling system, sample magnitude and sample size determination, data gathering technique and type data analysis.

The researcher in **Chapter four** presented and analysis of findings of respondent's view. And lastly, in **fifth chapter** offered the summary of research findings, inferences from the findings and recommendations from which industry can rely on to enhance the sustainability of Building Finishes in the Real Estate Sector of Ghana.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 OVERVIEW OF THE REAL ESTATE SECTOR IN GHANA

The recent surge in housing need of mostly urban duelers has culminated in the need for mass housing in Ghana. Despite government effort to solve this problem, the mantle bearer in averting this situation is the Ghana Real Estate Developers Association. (GREDA)

GREDA is a pool of private Property developers operating almost solely in Greater Accra Region and in recent times Central Region and Ashanti Region Other metropolitan and municipal jurisdictions have not had the concentration of realtors with the open market as a target. Formation of GREDA date as far back as 1988 as a result of the restructurings that the housing industry was embarking on during that era under the supervision and with the support of UNDP and the World Bank. GREDA was meant to replace the public housing development agencies, State Housing Company (SHC) and Tema Development Corporation (TDC), which were woefully financially distressed at the time (UN Habitat, 2001). GREDA galvanized the emergence of private commercial realtors to complement the state and individual efforts. GREDA grew from a membership of thirty (30) at inception to over One hundred and thirty –Six (136) as at June 2016.

The endeavors of GREDA centered on the elites in society and a financial class that can only be described as high income earners. The membership of GREDA and their operational capacity has also grown in multiplicity with a few becoming transnational conglomerates entering the real estate markets in west African sub region and few of them changing focus from housing into land servicing firms. Progressively, attention is being given to exclusively housing areas that materialize as gated enclaves.

The front bearers of GREDA in the high range class includes; Regimanuel-Grey, Devtraco Limited, Buena Vista and Rehoboth Properties. Virtually all the realtors that are focusing on the middle income earners are native firms with local ownership and administration. The key players here include Manet Housing Limited, Hydrafoam and Kuottam (UN Habitat, 2001). Some other firms that are also making great strides in the industry are; Emef Estate Ltd, Redrow Estate, Castle Gate Estate Ltd.,Human Capital Solutions Ltd currently working on the Apollonia city of Light, Blue Rose Estate Ltd., Koans Estate Ltd. etc.

2.2 SUSTAINABILITY

Concluding half of 1960s and early 1970s a lot of scholars and theorists noticed that insistent economic expansion was aggravating deterioration of Mother Nature's provision, and indicated their view that it could not be sustained eternally. One of the famous studies done at this time was initiated by the Club of Rome, which was formed in 1968 by scientists, educators, economists, humanists, industrialists and civil servants under the leadership of Italian businessman Aurelio Peccei. The study was carried out by a team of scientists at the Massachusetts Institute of Technology (MIT) in the USA and published as a book called 'The Limits to Growth' (Meadows et al 1972).

It is evident that as time goes by, the natural resources of the world lessen and it is up to the present and forthcoming generations of humans to safeguard the resources available in order that they last for as long as it can. Selecting building finishes with minimized adversarial effect on the environment, use fewer vital resources, maintain the health and well-being of occupants, and protecting some of the raw materials for future structural development is a goal for the architectural and real estate construction industries

(Larnyoh, 2014). It is not relevant to designed for "cradle to grave" standards; on the order hand, the new mentality must be "cradle to cradle". That is to say once a building has expired or has reached the end of its valuable lifespan, the contents and structure will be used to build newer and improved structures without extensive use of natural resources from the environment (Merriam et al., 1987).

Many have defined sustainability in different ways but two main definitions that carry much weight in every sustainability discussions are: Sustainability is meeting "the provisions of the present without endangering the capability of generations after us to meet their own needs" (UN World Commission on Environment & Development: Brundtland Commission, 1987). The U.K. Forum for the Future also defined Sustainability as "An active process which enables all people to appreciate their potential and improve their quality of life in ways which simultaneously guard and enhance the Earth's life support systems"

2.2.1 PILLARS OF SUSTAINABILITY

Sustainability discussion turn to be environmental factors bias, sustainability encompasses a lot more than just environmental factors – economic and social dimensions are also key parts of Sustainability (Constructing Excellence, 2013).

2.2.1.1 Environmental Factors

Essentially an environmentally sustainable scheme must uphold a stable resource base, shunning over exploitation of renewable resource schemes and exhaustion of nonrenewable resources only to the extent that investment is made in acceptable replacements.

This includes maintenance of biodiversity, atmospheric stability and other ecological functions not ordinarily classed as economic resource (Bawa, 2009).

2.2.1.2 Economic Factors

Bawa (2009) further retreated that, an economically sustainable method must be able to give profits on ongoing basis, to maintain controllable levels of economic imbalance. That is the economic benefits of today's choice of building finishes must not have a detrimental effect on the economy of the user in the future.

2.2.1.3 Social factors

A socially sustainable system must achieve distribution fairness, satisfactory delivery of social amenities within the ecosystem (Bawa 2009).

2.2.2 MODELS OF SUSTAINABILITY

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

2.2.2.1 Three-legged Stool Model

In the iception of Sustainability discision, 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 crutial 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 2.1 – The Three (3) Legged Model Of Sustainability

Source: World Conservation Union (IUCN, 2006)

2.2.2.2 Three – Overlapping – Circle Model

The overlapping-circles model of sustainability as shown in Figure 2.2 recognizes the overlapping of economic, environmental, and social aspects of Sustainability. Based on this model, the circles are resized. The resizing indicates that one of the dimensions is more prevailing than the other two. For instance, some commerce executives would rather show the economic dimension as the principal circle since it is the most important to their success and it impact most on their dealings. They illustrate the society at the next significant circle because that is where their clientele and some other important industry player live. The last circle is shown as the environment since it is the most remote to their usual trade mixes. Sadly, this model seeks to communicate that some parts of the dimensions can exist on their own. This model shows that the part of the circles that have plain colours such as Red, Blue, and Green can exist on their own. This grave anomaly culminated in the promulgation of the next, more accurate precise according to

sustainability scholars

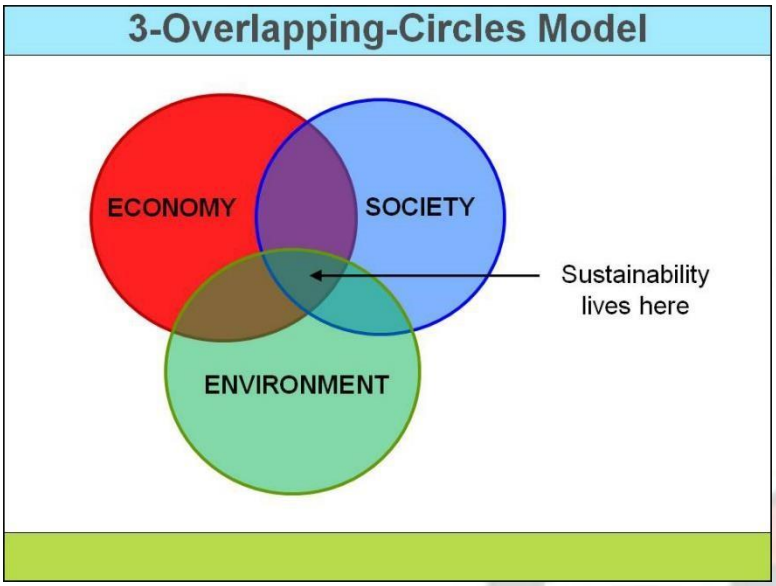

Figure 2.2 Three (3) – Overlapping – Circle Model,

Source: Newman and Kenworthy (1999)

2.2.2.3 Three (3) –Nested – Dependencies Model

The 3-nested-dependencies model has resulted under the premise that there is a co-reliant reality. This indicates that the human society is a complete subset of the Environment- This is to say that we cannot live without fresh clean air, a balance meal, portable water, productive soil, and other resources that Mother Nature provides. The Society on the other hand create their economy.

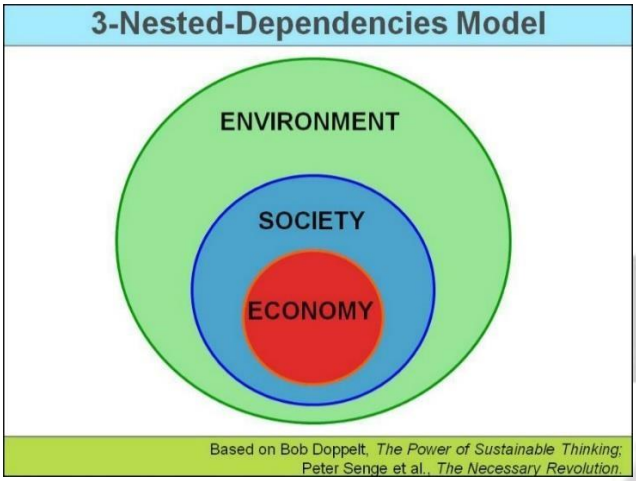

Figure 2.3 Three (3) –Nested – Dependencies Model,

Source: Giannetti (1993)

2.2.3 SUSTAINABLE CONSTRUCTION

This is the integration of materials and products in housing and infrastructural development that will necessitate abridged levels of the provisions of Mother nature and an upturn use of old materials and parts for the same or similar purpose hence alleviating wastages as much as possible. Wall Papers, Bamboo Sheets, Steel, other metals, glass and prefabricated parts using combinations of these, as well as recyclable substitutes for concrete are examples of sustainable materials and products (Building and Construction Authority, 2007).

2.2.4 FEATURES OF SUSTAINABLE BUILDING FINISHES

Kim et al. (1998) identified certain measures, centered on the material life cycle that can be used in defining the environmental sustainability of both structural and construction finishing materials. The presence of some of these features in building materials make it environmentally sustainable. even though this cannot be a conclusive yard stick for stating that a material is sustainable, A production process that avoids pollution, Manufacturing

systems that work at reducing "muda", Building finishing materials that have high tendencies of being recycled, Effort toward reduction of Embedded Energy, The Use of Natural Materials, Materials that have to ability to prevent creation of a lot of waste during its installation, Material that are locally available, Energy Efficient and Renewable Energy Systems that can serve longer life spans and the like. The issue of Reusability, Recyclability and Biodegradability is also important in determining the Sustainability of a building material.

The University of Michigan in a survey also came up with figure 2.4 as shown below giving three main grouping of green features of building materials (Kim et al., 1998).

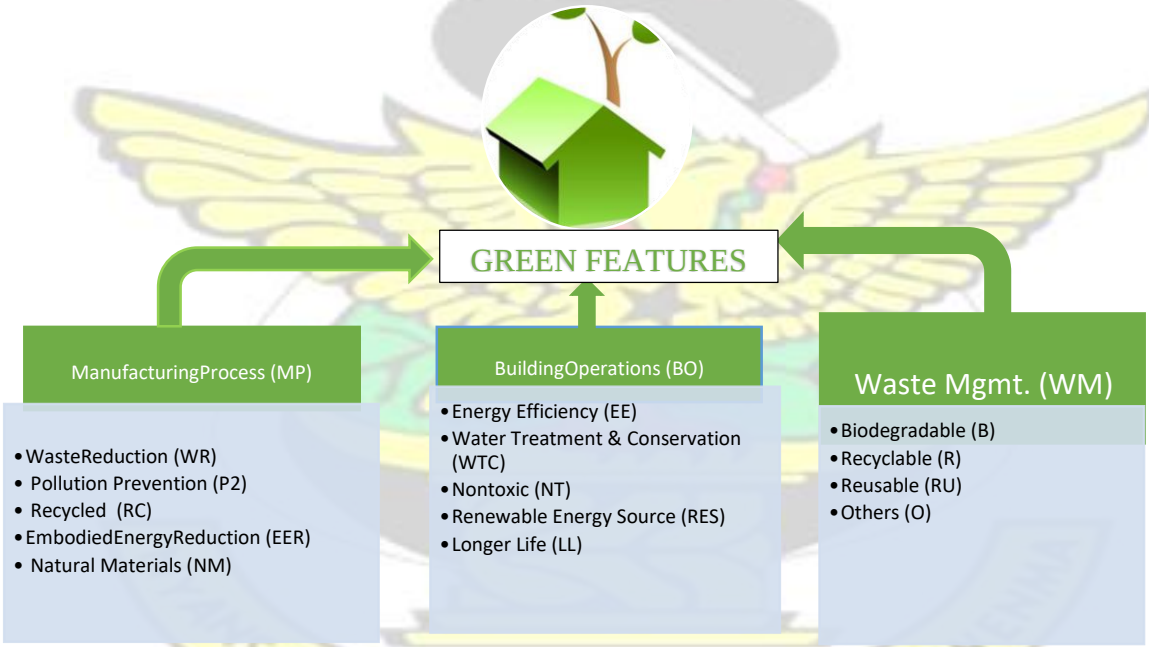

Figure 2.4: Key to the green features of sustainable building finishes

Source: Kim et. al., 1998

2.2.5 BARRIER TO THE USE OF SUSTAINABLE BUILDING FINISHES

Griffin et al. (2009) conducted a research to investigate the barriers to the use sustainable building materials. After a focus group discussion the following came out as the seven highest barriers to making green choices:

i. The perception that there will be cost increments ii. Bye laws ,regulation and Code compliance iii. Availability of green building finishing materials

iv. Customers' expectations

v. Construction time, methods, or quality vi. Stakeholders understanding of green options vii. Ample evaluation time to ascertain alternatives

Akadiri, (2015) also identify Availability of Green rating data as one the major barrier to green choices.

2.3 EMBODIED ENERGY

Issues of Sustainability cannot be discuss without the subject of Embodied energy. Embodied energy deserves to be another factor in the equation of sustainability (Jackson 2005). Horne (2008) attempt to explain embodied energy of any structure as the total energy required to build it. That is to say it is the power required to tap the raw materials, process and manufacture them as necessary, transport them to site and put them together to form a habitable space.

2.4 BUILDING FINISHES

The architectural forms and styles in residential building are mostly cautiously articulated in a variety of primary building materials. A good Building finishing materials are generally of highly decorative and structural quality, durable and usually resistant to premature weakening if understood and cared for through its service life with prudent maintenance practices (Walls, 2009). To achieve this, building finishes must carefully selected and most importantly building finishes must be carried out in the right order. Once the building finished is installed care must be taken to avoid damage.

Backing of building finishes which form the background of finished surface must be allowed to cure properly prior to the application of finishes. Before the selection process of building finishes commence, the following must be considered: - the function of the facility, scratch and wear, upkeep and economic life of the material.

2.4.1 CLASSIFICATION AND TYPES OF FINISHES

Guide (2013) classify Building Finishes in two major categories these are:

i. Self-finish or applied finish; and ii. wet finish or dry finish.

Types of finishes commonly found in domestic buildings are:

Applied finish: A type finish which is actually applied insitu on site; and

Self-finish: A finish which is inherent in the material and does not have to be specially applied on site.

Table 2. 2 - Type of building finishes and their life span

Self Finish	Applied Finish	Life Span
	Plaster on masonry walls	50 – 100 years
	Paint	4 - 8years
	Wallpaper	4 – 10 years
	PVC floor tiles	10 years
Facing brick		Life of building (100 years plus)
Natural stone		100 years plus
Natural slate		100 years
Natural wood		Relative (Depends on type of wood)

Source: CITB-Uk, 1994

2.4.1.1 Wet Finishes

One of the main complications with wet finishes is that substantial "drying out time" is needed for the building plus expansion / shrinkage problems with timber and concrete components. Some of the wet finishes are Plaster, Paint, and Wallpaper etc.

2.4.1.2 Dry Finishes

The utmost benefit of waterless finishes when compared to wet finishes is that no shrinkage will occur throughout the dry out process. A dry finish should be uniform in colour, size and be true to shape. The installation of dry finishes does not prevent user of

the facility from carrying out their activities in the building even if it is a renovation project(Blok et al. 2007).

Some of the example of dry finishes are Plaster board, timber paneling, Carpet etc.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This section studied methods and selected the method by which the researcher achieved the objectives of the study. The discussion here borders on issues such as research design, The Population and Sampling Technique, research data sources, data collection instrument and how the data gathered was analyzed.

3.2 RESEARCH DESIGN

The Researcher employed survey as the style for the research; Surveys represent one of the widely method of both quantitative and qualitative research and very useful to find small amounts of material from a wider selection of people in the expectations of making an overall assertion (Driscoll, 2011). In this Study, the researcher selected a sample of respondents from the whole population and solicited information from them using a standardized questionnaire. The questionnaire was a structured written set of questions that was 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 lowtech nature of the industry. Using hard copy questionnaire also afforded the researcher the opportunity to see and verify some information being provided by respondents.

3.3 Population

The population studied is the Ghana Real Estate Developers Association (GREDA). Information gathered shows that Ghana Real Estate Developers Association (GREDA) as at the end of June, 2016 have 136 members in good standing. About 130 members

representing 95.58 % of these companies operate in the Greater Accra Region. Ashanti Region has 2.94% share, whiles the Central Regions has only 1.47%.

3.3.1 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).

Formula was used to compute the suitable sample frame, Yamane (1967) provides an abridged formula to calculate sample sizes. This formula was used to calculate the sample sizes in this study. Eighty-eight (88%) confidence level and margin of error (α) = 0 .12 were assumed. The formula is; $n = N / (1 + N (\alpha)^2)$ where (n) is the Sample size, (N) is the population been drawn from and the (α) represents precision level or margin of error.

Based on the Yamane (1967) formula as stated above the sample size for the study was determined; $n = 130 / (1+ 130 (0.12)^2)$ Where; n=Sample Size, N=Sample Frame (one key personnel each from 130 companies) α = margin of error (which will be 12% or 0.12). n = 45 respondents. A sample size of fourty– five (45) Key professionals in the real estate sector were obtained from using the formula. Questionnaire were given to Sixty (60) professionals and fourty– five (45) collected for analysis. The distribution of 60 questionnaire was a strategy adopted in order to forestall the dangers of non-responses should it happen.

3.3.2 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. Multi-stage or two stage sampling techniques was adopted for this research. This is a technique where sampling is conducted to arrive at the sample size in stages (Elder, 2009). In that, the researcher purposively sampled the association members in the greater Accra region. 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).

At a second stage, Simple random sampling was adopted using the result of the first stage as a sample frame for selection. Elder(2009) describes simple random sampling as selecting units from the population through randomization , for example, through a raffle, so that every member has an equal chance of being picked, and there is an equal chance of all various permutations of selections.

In view of the fact that about 95.58% of realtors reside in the Greater Accra Region, a decision by the researcher to draw his sample randomly from the Greater Accra Region will reflect the true state of affairs in the Real Estate Sector of Ghana.

3.4 TYPES AND SOURCES OF DATA

This research harnessed the advantage offered by both Primary and Secondary Data Sources. The Secondary data culminated in the study being hinged on theoretical considerations whereas the primary data enriched the study by realistic findings.

However, the secondary data sources used for this study generally in the literature review chapter was to advance the arguments that serve as the basis for the practical study.

3.4.1 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 data collected for this study used the survey method to collect information directly from the respondents. This is to say, data was collected directly from the key and relevant staff members of the selected real estate companies. Primary sources of data are tailored to a specific need and it has the ability to elicit the needed data from the respondents to enable effective analysis. This study relied on self-administered questionnaires due to 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.

3.5 DATA COLLECTION TOOL

The data gathering tool adopted in collecting the primary data was questionnaires. Essentially the primary reason for the use of questionnaire are to collect precise data with outmost dependability and reliability, and to solicit data appropriate to the objectives of survey. The survey questionnaire have demonstrated to be one of the best method of collecting primary data (Yin, 2003). Closed ended questions were used to simplify the administration of the questionnaire. However, where the researcher considered it essential, open ended questions were used. A Likert scale of (5point) was used since it was deemed to be an excellent method of measuring the attitude of respondents towards an attribute.

According to Yin (2003), the Likert scale is easy to use and decreases doubt, misunderstanding and error. The merits here are that it promotion in lessening nonresponse by reducing respondents' fatigue.

3.6 DATA COLLECTION PROCEDURE

The effort to gather data from the field for this study took a very strenuous two weeks to accomplish. A sample of the survey questionnaire designed were given to key personnel in the real estate companies 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 engineer at Devtraco Limited. 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 done personally by the researcher.

3.7 METHOD OF DATA ANALYSIS

Every research has to properly examine and interpret the data collected from the respondents. Neuman (2007) states that the method of analysis is very important to every survey approach. Several methods actually can be used in probing, classifying, tabulating and having a combination of the proofs to deal with the objectives of the study. Looking at diverse sources of data collected for the study, the researcher addressed how the data would be processed and analyzed by using a well-structured Questionnaires. They were coded and analyzed with Statistical Package for Social Scientist version 20.0 (SPSS 20.0) using descriptive statistics.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

The Section critically analyzed the information collected from the respondents on the issue of Sustainability of Building Finishes in the Ghanaian Real Estate Sector.

4.2 PRESENTATION OF RESULTS

The data was analyzed with the objectives of the Study in mind: Each questionnaire was examined and data inputted carefully into a Data Analysis Software (SPSSv20.0).

Table and Chart were developed from relevant questions using descriptive statistics relative importance index (RII).

The following analysis show the responses received from fourty-five (45) Key Personnel in the real Estate Sector.

4.3 CHARACTERISTICS OF RESPONDENTS

To give weight to the results of the study the researcher deems it relevant to probe the background of his respondent. The Characteristic of the respondent were investigated to ascertain; The Educational Level of the Respondents, Their Professional role in their respective organizations, how long they have been serving in their role and Whether or not they are members of any Professional body or Bodies.

4.3.1 EDUCATIONAL LEVEL OF RESPONDENTS

Figure 4.1 below shows that Majority the respondents of the survey were either Holders of Master's Degree (MSc, MPhil, and MBA), Post Graduate Diploma, or Bachelor of Science. Thirty-Six percent (36%) of the Respondents were holder of a Master Degree,

Thirty –Three Percent (33%) Holds a Bachelor's Degree, whiles Twenty-Seven Percent (27%) were holders of Post Graduate Diploma. That notwithstanding about two (2%) of the Respondents have Higher National Diploma and another Two Percent (2%) also stated that they have National Vocational and Technical Institute Certificate.

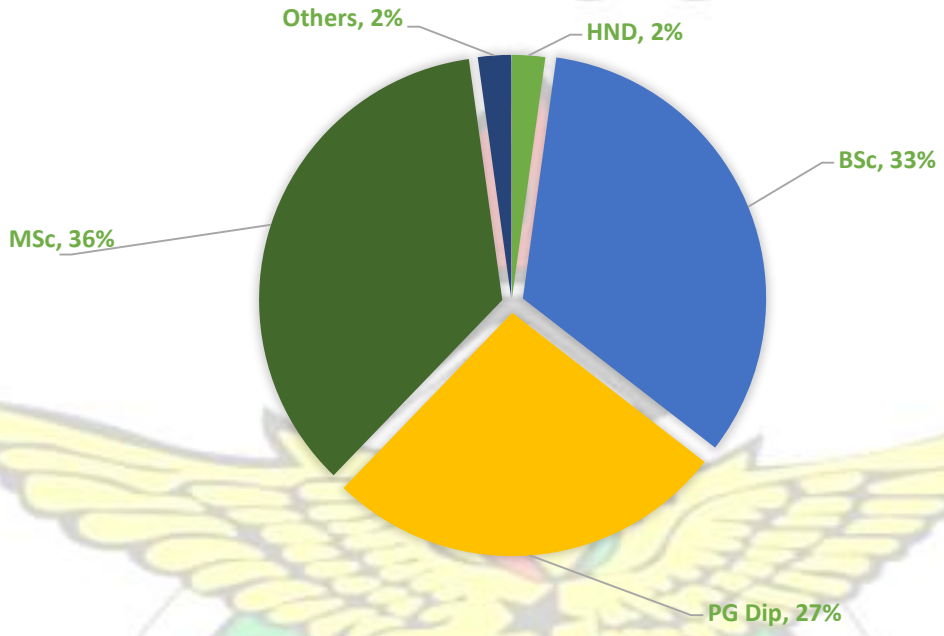

FIGURE 4.1- EDUCATIONA LEVEL OF RESPONDENTS

Source: Field Data ,2016

4.3.2 PROFESSIONAL ROLE IN ORGANIZATION

As shown in Figure 4.2 below, the research reveals that, thirty-eight percent (38%) of the respondents work as professional Architects for their firms, Engineer represented twenty percent (20%) of the respondents surveyed, Sixteen-Percent (16%) of the sample

population are Quantity Surveyors, Fifteen Percent (15%) Work as Project Managers while other profession constitutes Eleven Percent (11%) of the Respondents.

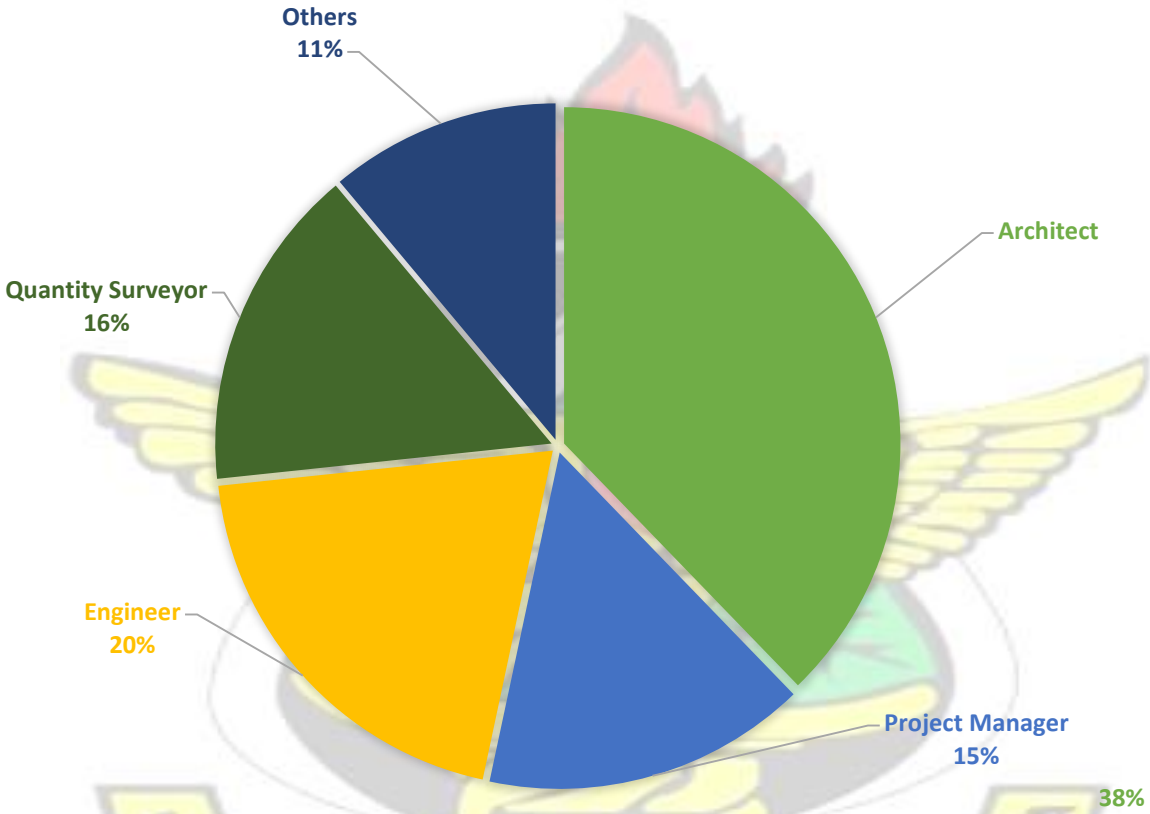

FIGURE 4.2 PROFESSION OF RESPONDENTS

Source: Field Data, 2016

4.3.3 NUMBER OF YEARS RESPONDENTS WORKED IN CURRENT ROLE

In order to ascertain the quantum of experience Respondent have about their current role the research delved into how long "in terms of number of year" they have worked in the

Current position. Figure 4.3 represent the results as: Fourteen Percent (14%) worked in their current role between zero (0) to two (2) years. (0-2 years), thirty-four Percent (34%) worked between two(2) to four(4) years(2-4years), Twenty-nine Percent (29%) worked from four(4) to Six (6) years (4-6)years, and as much as twenty-three Percent have been in the current role for more than Six (6) years.

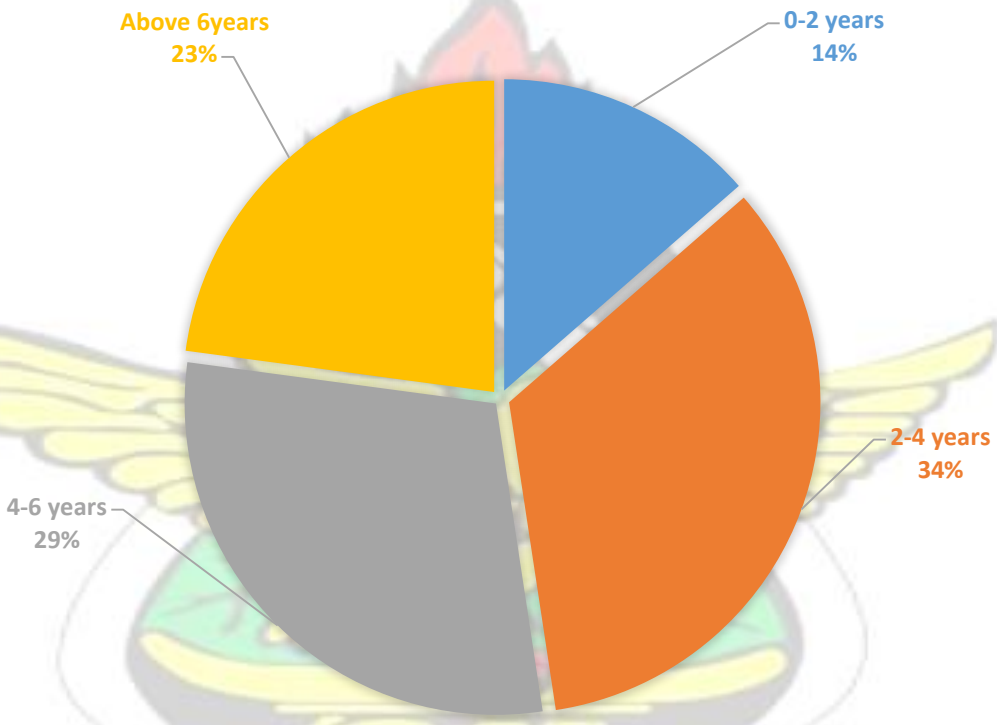

FIGURE 4.3 NUMBER OF YEARS RESPONDENTS WORKED IN CURRENT ROLE

Source: Field Data, 2016

4.3.4 MEMBER OF PROFESSIONAL BODY / BODIES

The study collected data from fourty-five (45) Key personnel in fourty-five (45) Real Estate Companies in Good Standing as at June 2016, the results are as shown in Table 4.1.

Thirty-four (34) Personnel representing 75.6 % were Professional Members of their various Professional Associations whiles Eleven (11) Respondents also representing 24.4

% of the total population sampled do not belong to any professional associations.

Table 4.1 Member of professional body / bodies

Are you a member of a professional body?	Frequency	Percentage	Cumulative Percentage
Yes	34	75.6	75.6
NO	11	24.4	100
Total	45	100	

Source: Field Data, 2016

4.4 FACTORS CONSIDERED IN THE SELECTION OF BUILDING FINISHES

The data in Table 4.2 below represent the view of respondents on the factors that are considered in the Selection of building finishing Materials. The first four (4) factors according to the respondent are Significant to the Decision making process of Selecting building Finishing Material in the Real Estate Sector of Ghana. These Factor in order of Ranking "First (1st) to Fourth (4th) are, Aesthetics, Initial Cost, Availability of the Material and Life Cycle Cost.

The Sampled Population however remain neutral about factors such as; Installation, Maintenance and repair Ease, Use of Non-toxic or less-toxic Material, Energy Efficiency, Local Material, Flexibility for Future Renovation of Building, Human Health and Ecological impact, Reduction of Construction waste, Renewable Energy System, during the selection of building Finishing Materials.

The Respondent further went on to express their view that some factors such as Flexibility for future use, Biodegradability, Recyclability, Pollution prevention measure in manufacturing, LEED Green Building Rating system were insignificant to the selection of building finishes in the Ghanaian Real Estate Sector.

TABLE 4.2 Factors considered in the selection of building finishes.

No	Factors considered in the selection of building finishing materials	NO.	Minimum	Maximum	Mean	Std. Deviation	Ranking
1	**Aesthetic**	44	2	5	4.34	0.861	1st
2	**Initial Cost**	45	1	5	4.22	0.927	2nd
3	**Availability of Material**	45	1	5	4.13	0.944	3rd
4	**Life Cycle Cost**	45	1	5	4.11	0.959	4th
5	**Installation, Maintenance and Repair Ease**	44	1	5	3.27	1.370	5th
6	**Use of Non – Toxic or Less – Toxic Material**	44	1	5	3.20	1.231	6th
7	**Energy Efficiency**	45	1	5	3.18	1.202	7th
8	**Local Material**	45	1	5	3.02	0.965	8th
9	**Flexible for Future Renovation of Building**	45	1	5	3.02	0.941	9th
10	**Human Health and Ecological impact**	44	1	5	2.95	1.346	10th
11	**Reduction of Construction waste**	44	1	5	2.75	1.366	11th
12	**Renewable Energy System**	45	1	5	2.56	1.235	12th

13	**Flexibility for future use**	44	1	5	2.42	1.177	13th
14	**Biodegradability**	43	1	5	2.30	1.103	14th
15	**Recyclability**	45	1	5	2.24	1.190	15th
16	**Pollution prevention measure in manufacturing**	45	1	5	2.09	1.145	16th
17	**LEED Green Building Rating system**	44	1	5	2.02	1.267	17th

Source: Field Data, 2016

4.5 BARRIER TO MAKING SUSTAINABLE CHOICES WHEN SELECTING BUILDING FINISHING MATERIALS

Analysis of the data gathered brings to bare factors that militate against making sustainable choices in Table 4.3 below. The Highest Rank among other Factors is Perceived increase in cost, Availability of green rating Data is ranked second, Response from Key professional in the Industry also agree to the fact the Market Trends also do not help the course of making Green Choices.

In order of significance this how respondents rank the factors from the 4th to the 10th Position, Client Expectation, Competitors Choice, Availability of green building finishing materials, Construction time, methods, and quality, Time available to identify and evaluate alternatives, Stakeholders understanding of green options, and Code and regulation compliance respectively**.**

Some of the respondents suggested that customer's awareness, perceive unsuitability for climatic condition, Availability of tradesmen to install finishes such as wall paper, customer' preference are some of the barriers to making green choices.

TABLE 4.3 Barrier to making sustainable choices when selecting building finishing materials

No	Barrier to the Selecting Sustainable Building Fining Materials	NO.	Minimum	Maximum	Mean	Std. Deviation	Ranking
1	**Increase in cost or perceived cost**	44	1	5	4.00	1.034	1st
2	**Availability of green rating Data**	43	1	5	3.90	1.261	2nd
3	**Market trends**	44	1	5	3.89	0.895	3rd
4	**Client expectations**	43	1	5	3.70	1.124	4th
5	**Competitors choice**	44	2	5	3.66	0.861	5th
6	**Availability of green building finishing materials**	43	2	5	3.44	0.959	6th
7	**Construction time, methods, and quality**	41	1	5	3.32	1.350	7th
8	**Time available to identify and evaluate alternatives**	43	1	5	3.28	0.959	8th
9	**Stakeholders understanding of green options**	41	1	5	3.00	1.049	9th

10	**Code and regulation compliance**	44	1	5	2.00	1.201	10th

Source: Field Data ,2016

4.6 EXTENT TO WHICH IDENTIFIED BENEFITS OF SUSTAINABILITY AFFECT THE CHOICE OF FINISHES.

This research also endeavour to find out which identified benefits of Sustainability affects the choice of building finishing materials. Table 4.4 below brought to bear the view of respondents on this subject. From the research it was identified that, the only factor that very often affects material choice is "Value for money". About Ninety-four Percent (94%) of the Time when building finishing material selection goes on Value for money is considered.

According to the respondents sometimes the following sustainability benefits affect the process. Efficient project delivery, Social Equity, Economic development, Education and public awareness, equitable distribution of resources, Long term strategic planning, Precautionary approach to decision –making, Develop local skill and capability, Enhance public Health and Safety, Innovative solution to problems, Protecting, preserving, and restoring the natural environment, Establishment of clear plan and rules for service provision, Adaptability to changing need of society, Use of renewable natural resources, Accountability, Poverty alleviation, Balanced risk allocation and management.

It is quiet revealing to note that, Improve community mobility and Coherence between local, regional, national and global action are never considered and they don't affects the building finishing material selection decision making process.

TABLE 4.4 Extent to which identified benefits of sustainability affect the choice of finishes.

No	Extent To Which Identified Benefits Of Sustainability Affect The Choice Of Finishes	NO.	Minimum	Maximum	Mean	Percentage (%)	Extent
1	**Value for money**	45	2	3	2.82	94	***Very Often***
2	**Efficient project delivery**	45	1	3	1.98	66	
3	**Social Equity**	45	1	3	1.88	63	
4	**Economic development**		1	3	1.78	59	
5	**Education and public awareness**	45	1	3	1.78	59	
6	**Equitable Distribution of Resources**	45	1	3	1.73	58	
7	**Long term strategic planning**	44	1	3	1.73	58	***Sometimes***

8	**Precautionary approach to decision – making**	45	1	3	1.71	57	
9	**Develop local skill and capability**	45	1	3	1.71	57	
10	**Enhance public Health and Safety**	45	1	3	1.71	57	
11	**Innovative solution to problems**	45	1	3	1.69	56	***Sometimes***
12	**Protecting, preserving, and restoring the natural environment**	45	1	3	1.69	56	
13	**Establishment of clear plan and rules for service provision**	45	1	3	1.67	55	
14	**Adaptability to changing need of society**	45	1	3	1.67	55	

15	**Use of renewable natural resources**	45	1	3	1.66	55	
16	**Accountability**	45	1	3	1.60	53	
17	**Poverty alleviation**	45	1	3	1.56	52	
18	**Balanced risk allocation and management**	45	1	3	1.51	50	
19	**Improve community mobility**	45	1	3	1.44	48	***Never***
20	**Coherence between local, regional, national and global action**	42	1	2	1.40	46	

Source: Field Data **,2016**

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

In this Chapter the researcher presents the summarized findings of the survey, the conclusions and further gives recommendations for the way forward on the subject of Sustainability of building finishes as applied by the real estate sector in Ghana.

5.2 CONCLUSION

5.2.1 OBJECTIVE ONE: TO IDENTIFY THE FACTORS CONSIDERED BY COMPANIES IN THE CHOICE OF BUILDING FINISHES THEY USE.

According to objective one, this research sets out to identity the factors considered by companies in the choices of building finishes they use. Analysis of the results showed that, there are four (4) main factors that are significant to the respondents. These are Aesthetics, Initial Cost, Availability of the Material and Life Cycle Cost are the most significance in order of relevance.

The Sampled Population however was neutral about factors such as; Installation, Maintenance and repair Ease, Use of Non-toxic or less-toxic Material, Energy Efficiency, Local Material, Flexible for Future Renovation of Building, Human Health and Ecological impact, Reduction of Construction waste, Renewable Energy System. During the selection of building Finishing Materials.

The Respondent further went on to express their view that some factors such as Flexibility for future use, Biodegradability, Recyclability, Pollution prevention measure in manufacturing, LEED Green Building Rating system were insignificant to them in the selection of building finishes.

It is inferred from the results that most firms have not embraced sustainability, since the first three ranked factors 'Aesthetics', second rank 'Initial Cost' and third rank 'Availability of material' appear to be out of step with contemporary sustainability principles.

5.2.2 OBJECTIVE TWO: TO IDENTIFY THE BARRIERS TO MAKING 'GREEN' SUSTAINABLE CHOICES IN THE SELECTION OF BUILDING FINISHES

The researcher also sought to identify the barriers to making sustainable choices in the selection of building finishing material as objective number two. It was identified that:

Perceived increase in cost is the highest ranked barrier to making "green" choices, Availability of green rating Data is ranked second, whiles the third (3rd) most significant barrier is Market Trends.

In the order of how respondents rank the factors from the 4th to the 10th Position are; Client Expectation, Competitors Choice, Availability of green building finishing materials, Construction time, methods, and quality, Time available to identify and evaluate alternatives, and Stakeholders understanding of green options. Code and regulation compliance were not insignificant barrier to sustainable choices of building finishes.

5.2.3 OBJECTIVE THREE: TO EVALUATE TO WHAT EXTENT IDENTIFIED BENEFITS OF SUSTAINABILITY AFFECT THE CHOICE OF FINISHES

This research also sought to find out which identified benefits of Sustainability affects the choice of building finishing materials. From the research data it was identified that, the only factor that very often affects material choice is "Value for money". About Ninetyfour

Percent (94%) of the time when building finishing material selection goes on Value for money is considered.

Further analysis shows that respondents sometimes considers the following sustainability benefits the process in the selection of building finishes. Efficient project delivery, Social Equity, Economic development, Education and public awareness, equitable distribution of resources, Long term strategic planning, Precautionary approach to decision –making, Develop local skill and capability, Enhance public Health and Safety, Innovative solution to problems, Protecting, preserving, and restoring the natural environment, Establishment of clear plan and rules for service provision, Adaptability to changing need of society, Use of renewable natural resources, Accountability, Poverty alleviation, Balanced risk allocation and management.

It is quiet revealing to note that, "Improve community mobility" and "Coherence between local, regional, national and global action" are never considered and they don't affect the building finishing material selection decision making process

5.3 CONCLUSIONS

In view of the findings from this study the researcher concludes that:

1. Sustainability have not been fully embraced by companies in the Real Estate Sector of Ghana. Some Key industry players do not even consider it at all in their quest to achieve their organizations goal of housing Ghanaians;

2. Aesthetics, Initial Cost, and availability of material is a critical factor considered by key personnel in the Real Estate Sector during the selection of building finishing material;

3. Market Trends, availability of green rating data, and perceive increased cost are the major barriers to making green choices; and
4. Value for money is key to every company in their endeavour.

5.4 RECOMMENDATIONS

The researcher recommends that:

a. Public awareness efforts be directed to client and prospective Clients to stimulate a paradigm shift from the conversional building finishing material to sustainable alternatives;
b. Professional bodies should organize seminars for their members on the sustainability agenda hence bring Ghanaian professional up to speed about global action on sustainability;
c. Suppliers should make the effort to make available Green building finishes since its availability will stimulate a drive for change;
d. Academia should partner Professional Bodies to champion publication of Green rating data;
e. Coherence between local, regional, national and global action must be at the center of every approval of any real estate permit acquisition.
f. Research aimed at putting in public domain sustainable alternative should be encouraged; and
g. Government should encourage and assist private sector in the commercialization of research finding of "green" alternatives.

5.5 AREAS FOR FURTHER STUDY

a. The researcher recommends a further study to identify alternative sustainable building finishes for the key finishes used in the real Estate Sector, and comparative cost study for alternative sustainable building finishing materials be conducted.

b. The researcher recommends a further study to validate Factors considered in the selection of building Finishes in the Ghanaian Real Estate Sector.

c. The researcher recommends a further study to validate barriers to making "green" choices during the selection of building Finishes in the Ghanaian Real Estate Sector for publication.

REFERENCES

Akadiri, P.O.(2015) Understanding barriers affecting the selection of sustainable materials in building projects. *Journal of Building Engineering*, 4, pp.86–93.

Bawa K. S, Rai N. D., and Sodhi N. S (2009) “Rights, Governance, and Conservation of Biological Diversity” ⁎Sustainability Science Program, Harvard University, Cambridge, MA 02138, U.S.A.

Berry, C. and McCarthy, S. (2011) Guide to sustainable procurement in construction, CIRIA, Classic house, London.

Blok, K. et al. (2007). Residential and commercial buildings. *Climate Change 2007: Working Group III: Mitigation of Climate Change*, pp.387–446.

Brundtland, G.H.(1987). Our Common Future: Report of the World Commission on Environment and Development. *Medicine, Conflict and Survival*, 4(1), p.300.

Building and Construction Authority (2007). *Sustainable Construction*,

Constructon Industry Trianing Board (CIBT), (1994). materials used for internal finishes.

Constructing Excellence (2013). Constructing Excellence : The SME ’ s quick guide to Sustainability.

Currie, D. (2005). Developing and Applying Study Skills. *Developing and Applying Study Skills*, pp.89–107.

Ding, S.(2004)natural resource aboundance and Ecomic Growth, assessed at: www.umass.edu/resec/workingpappers

Driscoll, D.(2011). Introduction to Primary Research: Observations, Surveys, and Interviews. *Writing Spaces: Readings on Writing*, 2, pp.153–174. Available at: http://books.google.com/books?hl=en&lr=&id=u4VPAgAAQBAJ&oi=fnd&pg=P

A153&dq=Introduction+to+Primary+Research:+Observations+,+Surveys+,+and+Interviews&ots=ZtlkQYS3XO&sig=sOzEApr5zHx52bY8l_UTd5Al2Vk.

Elder, S. (2009). *School to work transition survey: A methodological guide*, Available at: http://www.ilo.org/employment/Areasofwork/lang--en/facet--LOC.EMP-_-EMP.YOU-_-TYP-_-InstructionalMaterial-_-2772/WCMS_DOC_EMP_ARE_YOU_EN/index.htm\npapers2://publication/uuid/C7DF1095-31ED-48BB-A640-613888FE0E82.

Fernández-Solís, J. (2008). "Is building construction approaching the threshold of becoming unsustainable? : a system theoretic exploration towards a post-Forrester model for taming unsustainable exponentialoids". Saarbrücken, Germany : VDM Verlag Dr. Müller

Ghana Statistical Service, GSS(2004) Gross Domestic Product

Giannetti, E. (1993), Vícios Privados, Benefícios Públicos? A Ética na Riqueza das Nações, Companhia das Letras, Lisbon.

Griffin, C.T., Knowles, C. & Allen, J.H. (2009). Barriers to the implementation of sustainable structural materials in green buildings.

Guide, S., (2013). The fundamentals of a quality finish. , (March).

Horvath A. (2004) Construction materials and the environment, annual review report,USA.

Horne, P.R. (2008). Embodied energy in buildings : A review. , (June).

Jackson, M. (2005). Embodied Energy and Historic Preservation: A Needed

Reassessment. *Association for Preservation Technology International (APT)*, 36(4), pp.47–52.

Kim, J. Houn G & Jout H. (1998). Qualities , Use and Examples of Sustainable Building Materials. *Building*, (December 1998). Available at: http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Qualities+,+Use+,+and+Examples+of+Sustainable+Building+Materials#1.

Larnyoh, E.A. (2014). Enhancing Environmental Sustainability within the Construction Procurement Process in Ghana.

Lenth, R. V, (2001). Some Practical Guidelines for Effective Sample Size Determination. *The American Statistician*, 55(3), pp.187–193. Available at: http://www.tandfonline.com/doi/abs/10.1198/000313001317098149.

Lippiat, B.C. (1999). Selecting Cost - effective green building products: BEES approach. ASCE Journal of Construction Engineering and Management, 125(6), 448 -455.

Living Planet Report(LPR)(2010) Biodiversity Biocapacity, and Development, available at: http://awassets.panda.org/downloads/wwf_lpr2010_Ir_en.pdf. Assesced 3 July 2016

Living Planet Report (LPR)(2008) Living Planet Report 2008. available at: www.footprint network.org/doc/energy%20report.pdf. Assessed 3 July 2016

Meadows, D.H., Meadows, D.L., Randers J. and Behrens, W.W. (1972) The Limits to

Growth: A Report for the Club of Rome's Project on the Predicament of Mankind, Pan, London.

Merriam, T. et al., (1987). Sustainability , Tile and LATICRETE.

Miaoulis, G. and Michener R. D. (1976): "An Introduction to Sampling." Dubuque, Iowa:endall/Hunt Publishing Company.

Neuman S.B.(2007) Hanbook of early literacy research. available at www.books.google.com: assessed 20 June 2016

Newman P. and Kenworthy J.(2006) "Urban Design to Reduce Automobile Dependence", Opolis: An International Journal of Suburban and Metropolitan Studies: Vol. 2: No. 1, Article 3. http://repositories.cdlib.org/cssd/opolis/vol2/iss1/art3

Shakantu,W.M., Tookey, J. E. and Chileshe, N. (2007) " Optimisation of Construction Logistics: a core competence for future construction industry, journal of construction Vol 1, no1, pp12-19

UN Habitat, (2001). *Housing Profile of Ghana*,

Walls, M. (2009). "Federal Funding for Conservation and Recreation: The Land and Water Conservation Fund" Washington, DC: Resources for the Future. Available at www.rff.org/orrg.

World Conservation Union (IUCN). (2006). "Guidelines for Application of IUCN Red List Criteria at regional levels": Version 3.0. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

Yamane, T. (1967). "Statistics, an introductory analysis", 2nd Ed., New York: Harper and Row.

Yin, R. K. (2003), “Applications of Case Study Research”, Sage, Thousand Oaks, CA, 2003a, 2nd edition.

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APPENDIX 1

QUESTIONNAIRE FOR KEY PERSONNEL IN THE REAL ESTATE SECTOR

Dear Respondent,

The researcher is a Master of Science in Construction Management student of the Department of Building Technology, Kwame Nkrumah University of Science and Technology (KNUST). This questionnaire seeks to collect data on the Topic: "**Sustainability of Building Finishes in the Ghanaian Real estate Sector"** Thank you in advance for your candid opinion on the subject matter. Be assured of the confidentiality and anonymity for all the responses you will provide. I count on your cooperation. Thank You.

Please Return or direct any enquiry to:

Edinam Kwame Torku,

P. O. Box CE 11400,

Tema Comm. 11, Tema.

Mob: 026 226 5598

E-mail:edimtalker@gmail.com

PART ONE: 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. 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 been in the Current Role
    a. 0 – 2 years
    b. 2 - 4 years
    c. 4 - 6 years
    d. Above 6 years

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

    Yes [ ]

    No [ ]

5. Are you involved in the Material Selection decision making process in your Firm?

    Yes [ ]

    No [ ]

6. In your opinion how do you understand the concept of Sustainability?

……
……
……
……
……

7. Which of the following do you agree is addressed by the principles of sustainability?

a. Social issues [ ]
b. Economic issues [ ]
c. Environmental issues [ ]
d. Social, Economic and Environmental issues [ ]
e. None of the above [ ]

Part Two: Factor considered in the Selection of Building Finishing Materials

8. Please rank the following factors considered in the Selection of Building Finishing Materials on a scale of 1 to 5 where:

1. Highly insignificant ***2. Insignificant*** ***3. Neutral***
4. Significant ***5. Highly Significant***

Factor considered in the Selection of Building Finishing Materials	***Scale view of the respondents***				
	1	*2*	*3*	*4*	*5*
The LEED Green Building Rating System					
Human Health and Ecological Impacts					
Installation, Maintenance and Repair Ease					
Flexibility for Future Renovations Building					
Life cycle cost					
Aesthetics					
Initial cost					
Availability of Material					
Flexibility for Future Re - use					
Recyclability					
Biodegradability					
Pollution Prevention Measures in Manufacturing					
Renewable Energy Systems					
Reduction of Construction Waste					
Use of Non-Toxic or Less-Toxic Materials					

Local Material					
Energy Efficiency					

Please Specify any factor that you consider in the selection of building Finishing material that have not been mentioned above……

……

……

……

Part Three: Barrier to the Selecting Sustainable Building Finishing Materials

9. *Please rank the following Barriers on a scale of 1 to 5 where:*

1. Highly insignificant ***2. Insignificant*** ***3. Neutral***

4. Significant ***5. Highly Significant***

Barrier to the Selection of Sustainable Building Finishing Materials	***Scale view of the respondents***				
	1	*2*	*3*	*4*	*5*
Increase in cost or perceived cost					
Code and regulation compliance					
Availability of green building finishing materials					
Client expectations					
Construction time, methods, or quality					
Stakeholders understanding of green options					
Time available to identify and evaluate alternatives					
Availability of Green rating data					

Market trends					
Competitors choice					

Please Specify any barrier you have in the selection of Sustainable building Finishing material that has not been mentioned above……

……

……

……

10. To what extent are these associated benefits of Sustainability considered by your firm when choosing finishes.

	Item	**Never**	**Sometimes Often**	**Very often All the time**
1	Accountability			
2	Adaptability to changing need of society			
3	Balanced risk allocation and management			
4	Coherence between local, regional, national and global action			
5	Develop local skill and capability			
6	Economic development			
7	Education and public awareness			
8	Efficient project delivery			
9	Enhance public Health and Safety			
10	Equitable Distribution of Resources			
11	Establishment of clear plan and rules for service provision			
12	Improve community mobility			
13	Innovative solution to problems			

14	Long term strategic planning			
15	Poverty alleviation			
16	Precautionary approach to decision –making			
17	Protecting, preserving, and restoring the natural environment			
18	Social Equity			
19	Value for money			
20	Use of renewable natural resources			

Thank you for your Time