UNIVERSITY OF KWAZULU-NATAL

A POLICY FRAMEWORK FOR THE IMPLEMENTATION OF SUSTAINABLE CONSTRUCTION IN NIGERIA

By

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DOCTOR OF PHILOSOPHY IN CONSTRUCTION MANAGEMENT

Supervisor: Dr Nishani Harinarain

NOVEMBER 2020

DECLARATION OF ORIGINALITY

As the candidate's Supervisor I agree/do not agree to the submission of this thesis.

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I, **Ayotunde Anthony Babalola,** hereby state that this thesis represents the original work of myself the author and is submitted for the Degree of Philosophy in Construction Management at the University of KwaZulu-Natal, South Africa. Where the works of other authors have been used, they have been duly acknowledged and referenced. This research has not been submitted before for any degree or examination to any other university.

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DETAILS OF CONTRIBUTION TO PUBLICATIONS that form part and/or include research presented in this thesis (include publications in preparation, submitted, *in press* and published and give details of the contributions of each author to the experimental work and writing of each publication)

Publication 1

Babalola, A.A & Harinarain, N., 2020. Improving Sustainable Construction Practice through Policy formulation and implementation as evidenced from Nigeria using a Structural Equation Modelling approach. [Submitted]

Publication 2

Babalola, A.A & Harinarain, N., 2020. Critical factors for improving Sustainable Construction Practice through Policy development in Nigeria, an exploratory factor analysis. [In preparation]

Signed……………………………………

DEDICATIONS

This thesis is dedicated to my immediate family; my wife, Oluwabusayo, my children, Akintunde and Abimbayo; my parents, Akinlolu and Bolade Babalola; and sisters Damilola, Olusola and Yewande who felt my absence the most.

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ABSTRACT

The practice of sustainable construction improves the quality of life of the citizenry. Based on the need to realise the tripod of economic, environmental and sociological improvements, many countries have realised the need to develop individual policies and plans to attain sustainability especially within the construction industry. While patterns of improvements and adequate policies are noticed in some developed countries, a lot of developing economies still grapple with the policy development stage for improved and sustainable construction patterns. Policies constitute the backbone on which decisions are made, practice is predicated and regulated, and it was thus expedient to demonstrate the effects of policies on sustainable construction practice especially in the context of developing countries.

This study developed a policy model for the implementation of sustainable construction practice in Nigeria. The model lays a foundation for policy development and industry transition towards sustainable construction. Based on in-depth literature reviews on sustainable construction practices in both developed and developing economies and policy development and practice in selected model countries, a conceptual model was developed.

Eleven semi-structured interviews were conducted in addition to two separate focus group discussions with seasoned construction professionals in the capital cities of Abuja and Lagos in Nigeria to confirm the outcomes from the literature review, gain a deeper understanding in a qualitative nature and refine the draft quantitative study instrument. Data obtained at this stage was analysed using Nvivo 12.

The data collection was based on probability sampling where 380 questionnaires were distributed, and 249 complete responses were received. Exploratory factor analysis (EFA) using Statistical Package for the Social Sciences (SPSS) version 27 using Maximum likelihood with promax rotation was used to determine the validity and reliability of the four constructs of the conceptual model. Confirmatory factor analysis (CFA) was conducted using AMOS Version 27 software programme to further test validity and reliability of constructs. The CFA revealed acceptable model fit of the measurement model after re-specification of some of the measurement models. At the end, the second order model was tested to determine the relationship among the constructs. The findings revealed that the data was acceptable, and all

the   four   hypotheses   tested   were   found   to   be   significant.

The findings of this research which include identifying the clear roles of the government as both a regulator of the industry and as a client for public infrastructure, relevant stakeholders in the industry and implementation patterns for sustainable construction practice have practical, academic, and methodological contributions to the evolving current body of knowledge in the area of policy development for sustainable construction practice specifically in the context of developing countries.

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ACRONYMS

AfDB	African Development Bank
AGFI	Adjusted goodness of fit index
AMOS	Analysis of Moment structures
ASHRAE	American Society of Heating, Refrigerating and Air conditioning Engineers
BCA	Building and Construction Authority
BCAC	Building Code Advisory Committee
BEEP	Building Energy Efficiency Programme
BMSM	Building Maintenance and Strata Management
BREEAM	Building Research Establishment Environmental Assessment Method
BSc,	Bachelor of Science
CFCs	Chlorofluorocarbons
CFI	Comparative fit index
CIDA	Construction Industry Development Agency
CIDB	Construction Industry Development Board
CIP	Construction Industry Policy
CO_2	Carbon di oxide
CSIR	Council for Scientific and Industrial Research
DoE	Department of Environment
DPWD	Department of Public Works Department
DPW	Department of Public works
EFA	Exploratory factor analyses
EIA	Environmental Impacts Assessment Act
EPC	Energy Performance Criteria
EPBD	Energy Performance for Buildings Directive
ET	Energy Targets
FEPA	Federal Environmental Protection Agency Act
FNIA	Fellow, Nigerian Institute of Architects
FNIOB	Fellow, Nigerian Institute of Building
FNIQS	Fellow, Nigerian Institute of Quantity Surveyors
FOCI	Federation of Construction Industry
GBCM	Green Building Council of Mauritius
GBCSA	Green Building Council of South Africa
GDP	Gross Domestic Product
GFI	Goodness of fit index

GHGBC	Ghana Green Building Council
GHG	Greenhouse Gases
GMS	Green Mark Scheme
HND	Higher National Diploma
HVAC	Heating, Ventilating and cooling
IBM	International Business Machines
IBT	Innovative Building Technology
ICC	International Code Council
IFC	International Finance Corporation
IPAP	Industrial Policy Action Plan
ISCP	Improved sustainable construction practice
ISO	International Standards Organisation
KMO	Kaiser-Meyer-Olkin
LASBCA	Lagos State Building Control Agency
LED	Low emitting Diodes
MBA	Master of Business Administration
MNIOB	Member, Nigerian Institute of Building
MNIQS	Member, Nigerian Institute of Quantity Surveyors
MNITP	Member, Nigerian Institute of Town Planners
MNSE	Member, Nigerian Society of Engineers
MSc	Master of Science
NADMO	National Disaster Management Organization
NCC	National Construction Council
NFGB	National Framework for Green Buildings
nZEB	net-zero energy buildings
OECD	Organisation for Economic Cooperation and Development
PMP	Project Management Professional
RICS	Royal Institute of Quantity Surveyors
RMSEA	Root mean square error of approximation
RMR	Root mean squared residual
SDGs	Sustainable Development Goals
SEM	Structural Equation Modelling
SIDS	Small Island Developing States
SRMR	standardised root mean square residual
TGBC	Tanzanian Green Building Council
TLI	Tucker-Lewis index

UK	United Kingdom
UKGBC	United Kingdom Green Building Council
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
WABRI	West African Building Research Institute
WCED	World Commission on Environment and Development
WGBC	World Green Building Council,
WSHA	Workplace and Safety Health Act 2006

CHAPTER 1 - INTRODUCTION

1.1   Introduction

Policies are principles to guide processes and decisions to achieve desired rational outcomes. Policies as statements of intent, are generally implemented by the government within an industry or the management within an organisation (Zahariadis, 2016). Key roles of developing policies and guides for implementing them pertaining to sustainable construction practice have been identified to reside at the government and stake holder's level before the effects are noticed by other members of the construction industry (Alklani and Jupp, 2012).

The construction industry has a remarkable influence on the economy globally and nationally as it contributes significantly to the (GDP) Gross Domestic Product of developing and developed economies (Alaigede and Mensah, 2018). With 8.5% to 14.8% in Ghana between the years 2010 to 2015, 6.1% in the United Kingdom in 2017, 5.5% to 5.7% in Canada from 2014 to 2017 (Statista, 2018). The industry also provides shelter and capacity for man and his endeavours (Kissi, Sadick and Agyemang, 2018). This industry, like all other industries in the economy, develops under control of the government and in most cases, derives its function directly from the government under the supervision of a specific ministry, department or agency (Fox, Scott and Neale, 1999). To this end, the government often releases codes, standards, regulations, and policies through the supervising bodies to ensure that the construction industry is up to date and will improve as its products affect human life directly. These government directives and regulatory policies shape the industry and give it direction, and they can either specifically focus on the industry regarding processes, strategies, materials, usages, or on the stakeholders such as clients, professionals, contractors, users, etc (Kissi, *et al*., 2018; Statista, 2018; Windapo, 2014).

Government acts as a client to the industry in the delivery of buildings and infrastructure generally (Fox, *et al*., 1999; Ofori, 2012). Besides the government, there are other clients within the sector which are private clients and corporate entities whose specific project needs are often spelt out in their conditions of contract (Chigangacha, 2016). The participation of such active clients in the industry helps the government in the creation of jobs, payment of taxes and the delivery of projects which improve the infrastructural commitment of the government and its citizenry.

The practice of sustainable construction is a global movement with countries developing plans, strategies, and policies to implement and utilise in their construction industries. Implementing sustainable construction improves the quality of life of the citizenry and contributes to the global reclamation of environmental fortunes hitherto lost to man's depletive usage of the environment by meeting the basic needs of this generation without compromising on future needs (Brundtland, 1987;

Keeble, 1988). For the construction industry, the practice of sustainable construction involves all stakeholders, however, perhaps due to its over-reliance on the government for policy directions, not much has been done as regards policies. Some developing economies such as Oman (Alsanad, 2015), Cambodia (Durdyev, Zavadskas, Thurnell, Banaitis and Ihtiyar, 2018), Ghana (Ametepey, Gyedu-Asiedu and Assah-Kissiedu, 2015) are just recently drawing plans to join the rest of the developed global community who have a better outlook towards sustainability and sustainable construction practices (Solanke and Fapohunda, 2016). However, the current status of developing countries is generally lagging behind in the formulation and implementation of effective policies and relevant practices of sustainable construction (Howes, Wortley, Potts, and Howes, 2017).

From this premise, the study investigated the impacts of policies on the practice of sustainable construction in developing economies. The Nigerian context, in particular, has been analysed to develop a possible framework for the implementation of sustainable construction guidelines and measures in a context that construction activities lag behind the developed world and other developing countries with regards to the advancement of sustainability in construction.

After this introduction, a background to the study is presented to provide supporting evidence to the problem statement. Then, the problem of the study is articulated, and that leads to the aim, objectives, research questions and hypotheses for this study. The methodology taken for the study is outlined with assumptions and limitations expressed, thereafter the significance and contribution of the study is discussed. Finally, a chapter summary will summarise the main aspects discussed in the whole chapter.

1.2   Background to the study

1.2.1   Governmental role in sustainable construction policy formulation and implementation

Any policy is a result of decision making activities. Public policies seek to achieve desired goals for the overall benefit of the society (Torjman, 2005). A policy is a system of principles and plans to guide decision-making and achieve intended outcomes (Taeihagh, Bañares-Alcántara, and Givoni, 2014). It is a map for action in a specific context. A governance body generally adopts policies within an organisation and policies are typically formulated and instituted to avoid noticeable adverse effects or to seek some improvements. The strength of policymaking is integral to the power of government as one and that of the country at large (Birkland, 2015). When policies fail or are not implemented at all, the costs are often significant. Construction policies are a set of rules and regulations established at the national level by the government for adequate implementation within its construction industry (Hudson, Hunter, and Peckham, 2019). Construction policies are sets of documents expected to regulate construction processes and in turn improve the total well being for the citizenry by setting acceptable standards and requirements for practitioners and all stakeholders within the industry (Akadiri, Chinyio and Olomolaiye, 2012).

Governments have the overall responsibility to kick-start changes and developmental moves with the formulation and development of action plans, legal frameworks or strategies to encourage the application of appropriate standards and procedures upon which implementation and performance can subsequently be measured (Hai, 2016). It is widely accepted that unless pressured, the construction industry will not upgrade and implement required changes as it has been adjudged as one with a little response rate to change and innovation (Blayse and Manley, 2004). Construction professionals and the general public need to be made to understand and realise the advantages and benefits inherent in an improved built environment as it is safer to nature and the citizens in general (Miranda and Marulanda, 2001).

The government of some developed countries such as China, Korea, Singapore, and Japan have formulated and implemented comprehensive and detailed policies which offer both regulatory and non-regulatory approaches to the reduction in consumption of natural and high end manufactured resources, waste generation, recycling and disposal, to ensure environmental justice and socio economic equity during both the building production process and the effective usage of the facility (Solanke and Fapohunda, 2016). The tremendous successes recorded by some developed economies, notably the United Kingdom (UK) in sustainable construction is mainly because the government actively leads the whole process. The government fully understands the effective backward and forward linkages the construction industry has with the rest of the economy and thus developed an integrated policy framework for sustainable construction and led the initiative with the participation of all key players in its construction industry (Ebohon and Rwelamila, 2001). The effects of the implementation of these policies which are mostly regulatory and tied to tax benefits and penalties indicate that sustainable construction policies can either be regulatory or non-regulatory in implementation (Aniekwu, 2004; Heijden and Bueren 2013; Meacham, Visscher, Meijer, Chan, Chan, Laubscher and Echeverria, 2014).

Studies of urban sustainable development in developing countries by Elmualim and Alp (2016) in Cyprus, Ametepey, Gyedu-Asiedu and Assah-Kissiedu (2015) in Ghana, Ogunmakinde, Sher and Maund (2016) in Nigeria revealed that sustainable construction and sustainable development are not quite focal to government and decision makers in their decision-making processes (Kievani, 2010). Sustainable construction is mostly still an idea managed by industry elites, technocrats and professionals in specific fields. Only recently some national government authorities have begun to pay attention to it, more because of international and diplomatic pressures than inner desire from conviction, as observed for example in a study from the Peruvian construction industry (Miranda and Marulanda, 2001). In the Republic of Kuwait, the need for the introduction of specific policies on sustainable construction was highlighted by Alsanad (2015) due to the fact that awareness and general participation is low. The study explains that rules and regulations are needed to promote sustainable construction either through a revision of existing standards or the introduction of new ones. It stressed that governments need to

involve professional organisations, private sector and contractors as the first step to ensure stakeholders comply with the new regulations accordingly.

In sub-Saharan Africa, sustainable construction practice is still not the norm with just eight out of fifty-two countries tending to show readiness through registration and participation in the global and national sustainable construction drive (World Green Building Council, 2018). Phoya (2018) observed from working with contractors in Tanzania that sustainable construction practices and processes being observed on-site during the construction stage is still very shallow. The study attributed lack of adequate training and lack of support from local authorities, regulations, and enforcement as likely reasons.

Djokoto *et al*., (2014) while trying to identify the barriers to the practice of sustainable construction in the Ghanaian construction industry, concluded that the role of governments in the promotion of sustainable construction is effectively undeniable and suggested new rules and enforcement through regulatory and incentive instruments from a ready government because this was not the case (Ametepey, *et al.,* 2015). James and Matipa (2004) also related that the situation in Zambia was worse within the industry where construction professionals and contractors only use the term sustainability for lip service before obtaining contracts, concluding that the development of holistic guidelines and a compulsory usage of such graduated thresholds can guarantee growth and stimulate the sustainable development for the Zambian construction industry.

The situation in Nigeria is a little different. Although the awareness of sustainable construction is visible, there is a lack of adequate implementation because there are no regulations in place to mandate the public and there is no agency to enforce the practice. The non-participation of government, lack of policies towards sustainable construction, and lack of an overall construction strategy create a lacuna in the growth of the sector (Tunji-Olayeni, Mosaku, Oyeyipo and Afolabi, 2018; Ude and Ogunsote, 2016). Contrastingly, however, the South African experience has been to some degree successful with regulations and policies implemented from the bottom up starting with the most fundamental issues of building regulations, electricity, industrial and economic development plan while time and sector specific policies catalyse and complement the framework to make it a success (Montmasson-clair, 2012; Windapo, 2014).

1.2.2   Regulatory Models for Policy making

The need for looking at different policies and how it affects the practitioners of the industry and the general public is necessary so as to be able to get social backing during the implementation stage. From a sociological premise, isomorphism in the expanding field of globalisation studies, refers to an idea of contemporary nations and national societies that are influenced by the institutionalisation and entrenchment of dynamic world models constructed and illustrated through global cultural and

associational processes (DiMaggio and Powell, 1983). It is a measure of the type of policies and the attendant change it brings. Isomorphic changes are classified as coercive, mimetic, and normative. While coercive isomorphic changes refer to changes made in a situation wherein due to external factors and by cultural expectations, the government institutes policies, mandates, and/or laws, Normative isomorphic changes refer in contrast to a series of change brought about by professionalism, professional standards and systems and/or network influenced changes which will mean probably a coalition of some professional bodies within the industry. Mimetic isomorphism indicates a type of change brought about by organisational benchmarking and uncertainty in a bid to achieve better outputs.

A construction firm may feel the need to benchmark its activities to improve its processes and thus outputs. If the actions of a firm or an organisation are questionable or not agreeable with some certain norms, then the firm or organisation will face legitimacy pressure. Legitimacy pressures are usually the pressures that ensue from between the regulatory bodies and the organisation or between the organisation and its clients or customers. Legitimacy pressures are generally classified as regulatory pressures, normative pressures, and cognitive pressures (DiMaggio and Powell, 2000). With regards to firms, regulatory burden or pressures mainly originates from supervisory or enforcing governmental agencies. Normative pressures generally arise from clients, advocacy groups, and non-governmental organisations who may be environmentally affected by the effects of the organisation, while cognitive pressure is mostly from market forces and competition (Berrone, Fosfuri, Gelabert, and Gomez-Mejia, 2013).

The International Standards Organisation (ISO, 2008) identifies the importance of the building and construction in sustainable development and recommends guidelines and general principles for implementation. This is pursued by recognising that the application will involve all related processes, products, activities and will require the unswerving commitment and involvement of all stakeholders. Figure 1.1 relates a policy overview of construction stakeholders in the industry while also indicating the authority lines and feedback mechanisms expected. The ISO also recognises the fact that sustainable construction although being a global issue, the strategies for militating against it are mainly local and may differ in approach to suit the specific region. The ISO recognises the fact that although sustainable construction is a global target, strategies for achieving it are mainly local through individual nations and their specific regional inputs and weather conditions (ISO, 2008).
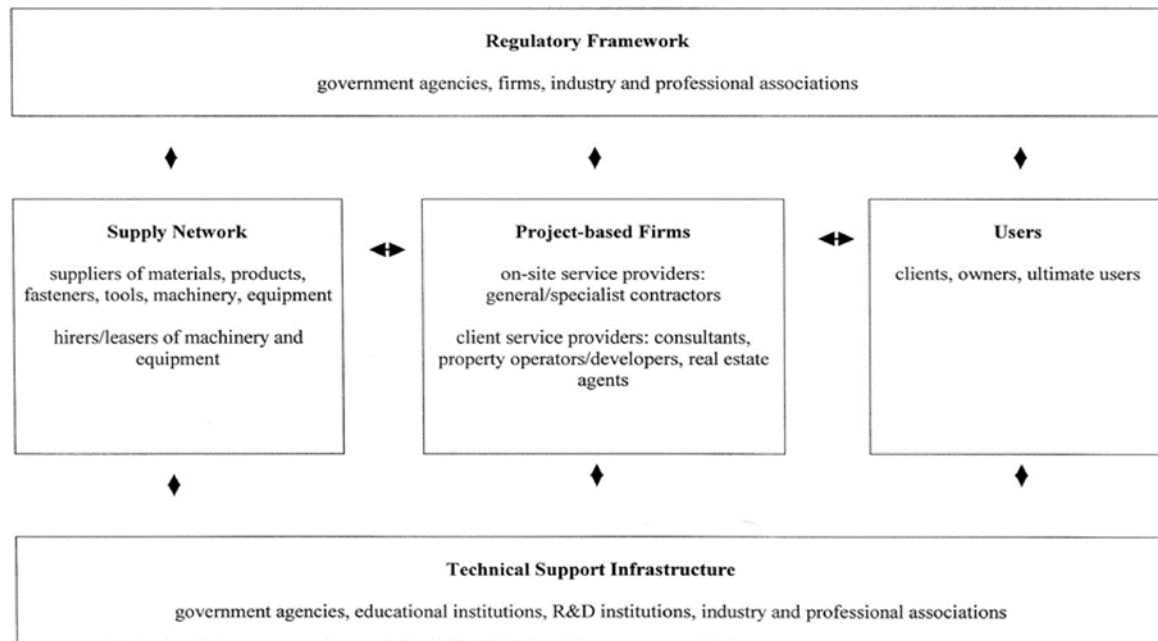
Figure 1.1: Participants within the construction industry project system (Gann and Salter, 1998: 439)

For developing countries, there is a need to identify the existence of these regulations and frameworks and investigate the effects of these policies on the construction stakeholders through the regulatory frameworks instituted by the government at various levels, the elite professionals, and the organisations engaged in the construction activities. When the government institutes a policy or framework for improvement, it is expected that practising professionals under their professional associations or through the industry board within the industry produce localised professional practice documents that directly relate individual professions to the policy or framework. This is to spell out expected professional requirements, and new frontiers. Members are expected to upgrade their knowledge and improve their competency in the implementation of their professional duties. A disclaimer is always clearly stated in practice and policy statements with a caveat for disciplinary actions for non-compliance (RICS, 2009). Organisational compliance with government policies and social expectations is essential for the growth and acceptance of construction and consulting firms within the industry to avoid the build-up of legitimacy pressures. Nowadays in the construction industry, certifications with standard innovations are being perceived as a best practice for contracting and consulting firms to gain public confidence (Neyestani, 2016; Sinha, Gupta and Kutnar, 2013).

1.3   Problem Statement

The lack of specific construction policies and regulations that promote the practice of sustainable construction in developing countries has been a cause of concern to the industry at large, as it creates a lack of focus both on the part of the government and the professionals in the industry and affects its growth. Construction stakeholders within the industry cannot contribute meaningfully as there is no

strategy and synergy for development. A policy or regulatory framework sets the stage for further developments within the construction industry, and it is expected to define and establish a basis or framework for performance and appraisal as it is holistic in formulation and targets all areas of practice. This lack of direction is quite evident in the way construction activities are still being undertaken in developing countries like Nigeria, creating harm to the citizens and the environment without any attendant social or economic benefits. Particuarly in Nigeria, building collapses, planlessness of cities and other unsustainable practices are rife, this causes loss of lives and revenues to the public and reduces the quality of life of the citizenry.

1.4 Research Questions

1) How is sustainable construction practised in Nigeria?
2) What is the awareness level of stakeholders towards the implementation of sustainable construction in Nigeria?
3) What are the policy barriers toward the implementation of sustainable construction practices in the Nigerian construction industry?
4) What are the policy drivers for sustainable construction in the Nigerian construction industry?
5) What strategies can aid the formulation and implementation of effective sustainable building regulations in the Nigerian construction industry?

1.5 Aim and Objectives

This study aims to help develop a workable policy framework for the formulation and implementation of sustainable construction in Nigeria through the following objectives:

1) To review the extent of sustainable construction practice in the Nigerian construction industry.
2) To assess the level of implementation of sustainable construction practices in the Nigerian construction industry.
3) To determine the policy barriers to implementing sustainable construction practices in the Nigerian construction industry.
4) To ascertain the policy drivers of sustainable construction in the Nigerian construction industry.
5) To develop and propose a policy framework to illustrate the effects of improved building regulations on sustainable construction practice in the Nigerian construction industry.

1.6 Hypotheses proposed in the study

H1: A positive relationship exists between government's role as the regulator and improved sustainable construction practice.

H2: A positive relationship exists between government's role as a client and improved sustainable construction practice.

H3: A positive relationship exists between the input of stakeholders and improved sustainable construction practice.

H4: A positive relationship exists between the strategies for sustainable agenda implementation and improved sustainable construction practice.

1.7   Outline Methodology

The objectives of this study were achieved through the following approaches;

1. An extensive literature review on factors relevant in the development of a workable policy framework for sustainable construction practice in the Nigerian construction industry.
2. The development of a conceptual model from the literature review.
3. Semi structured interviews were conducted among experienced construction professionals in the Nigerian construction industry to refine the model.
4. Focus group structured interviews of experienced construction professionals in the Nigerian construction industry context was used to refine the model to obtain an indepth understanding of the topic.
5. Questionnaires were distributed to validate the conceptual model in the context of the Nigerian construction industry.
6. Final model validation using structural equation modelling (SEM) technique based on the results of the questionnaire survey was conducted.

As depicted in Figure 1.2, the study was carried out in three stages. The first stage involved the development of the research questions, thereafter an extensive literature review to examine sustainable construction practices in developed countries and sub-Saharan Africa was achieved, a desktop study of the public policy making processes as it relates to sustainability studies and a review of policies relevant to sustainable construction practices in developing and developed economies was reviewed to identify leading factors necessary for the development of a conceptual model.

The second stage of the study involved two focus group interviews and the semi structured interviews. These field studies generated some conclusions in themselves and were also useful in refining some of the quantitative aspects of the study instrument (as discussed in chapter 11) in the triangulation and cross-validation of some of the findings of this research. The interviews comprised eleven seasoned construction experts purposely sampled for the exercise in the Nigerian construction environment in Abuja and Lagos. Some professionals in regulatory organisations for building and infrastructure

development were also involved due to their insights and experience. The outputs coded and analysed with Nvivo 12 were useful in gaining insights to refine the conceptual model.

Two intensive focus group interviews were conducted in an urban setting where there was evidence of adequate knowledge of the subject matter. One of the focus group interviews comprised eight professionals in private practice while the other one was conducted with seven varied professionals from government monitoring agencies. Sorting and content analysis was done with Nvivo 12 from QSR limited. The results from both different backgrounds were relevant in refining the conceptual model.

The third stage involved the validation of the conceptual model using the data generated from the field study through an industry questionnaire survey. Data collected randomly from 249 practicing construction professionals was collated, cleaned and analysed. Descriptive profiling of the respondents and normality of the data gathered was assessed. Due to the non-normality of the received data, maximum likelihood with robust standard errors and chi-square was employed. Exploratory factor analyses (EFA) of the data was done to check the unidimensionality of the constructs and establish the most relevant factors relevant to the study. This was achieved using SPSS version 27. Confirmatory factor analyses of the data was done using IBM AMOS version 27 to test the measurement models and the second order model in the final validation of the model. The hypotheses were also tested and conclusions reached. Findings from the field surveys were cross validated, triangulated and conclusions emanating from the study were subsequently arrived at. While undertaking the survey, validity, reliability and ethical issues including informed consent of the respondents, undue invasion of privacy and confidentiality of respondents were specifically taken into consideration.

Phase 1
- Development of Research Questions
- Literature Review
- Development of a Conceptual Model

Phase 2
- Semi Structured Interviews
- Focus Group Interviews
- Industry Survey (Questionnaire)

Phase 3
- Collate Data
- Analyse and validate Model
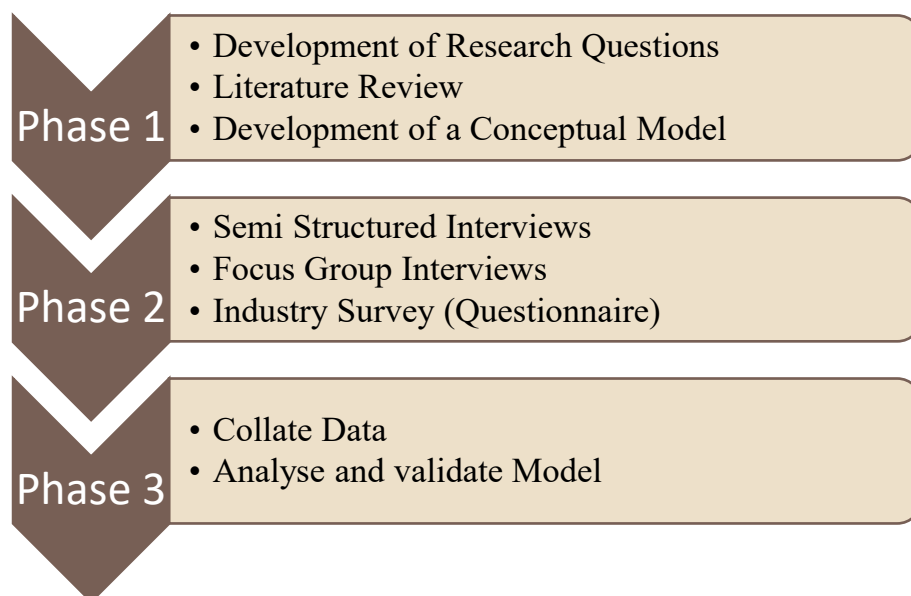
Figure 1.2 Research outline

1.8   Ethical Clearance

In line with the University of Kwa Zulu-Natal policy on research ethics, the principles of integrity was upheld in this research process included that information and data have been collected, processed, and presented in accordance with rigorous methods of scientific inquiry. This included correct citation of all sources used. Proper treatment of research participants in line with the principles of maximum respect for human rights. No harm was done in the course of this research and the research participants are not in a worse situation than they were met.

On informed consent, research participants were adequately informed about the aim of the research, consent to participate. Requests for auto recording of the interviews was clearly specified on the interview schedules and the respondents had the right to withdraw at any time. Questions where the respondents feel could be sensitive were also excused as such, the honesty of respondents is assumed for the proposed study as participation is voluntary. Questions asked were neither personal nor direct and as such, the confidentiality of the respondent is assured. Ethical clearance was obtained with ethical clearance number HSSREC/00000537/2019 as attached in Appendix A.

1.9   Scope of the Study

This study focused on the building regulations of emerging economies as it relate to sustainable construction with regards to possible gaps that need to be filled in developing countries. Building regulations set the minimum expected standards for the conceptualisation, planning, design and construction of infrastructure and buildings to ensure the overall wellbeing of the people in and about the building. The objectives of the study were chanelled to suit the focus of the study. The literature review study was limited to the policies on sustainable construction practices of five sub-Saharan African countries, namely South Africa, Tanzania, Ghana, Mauritius, and Nigeria. Out of all the countries, South Africa has 'an established' membership status of sustainable construction practice with the World Green Building Council, having been registered since 2007 with the global umbrella body for sustainable construction practice in the world. This indicates that the construction practices there are slightly improved in sustainability initiatives when compared to other sub-Saharan African nations.

1.10   Delimitation of the Study

Selected participants to enrol in this study include construction professionals in active practice who have over five years experience in their fields of practice. The fields of practice covered included architecture, building/ civil engineering and quantity surveying professionals who are registered with their professional organisations and are up to date in their individual continuous professional

development in Nigeria. This was considered essential as the research area bothers on a relatively new and fastly growing field of construction management. The study does not cover the opinions of town/ city planners.

1.11 Significance of the Study

Sustainable construction aims to build, restore and maintain harmony between the built and natural environments of man. The creation of human settlements that boldly asserts dignity and encourage social value provides not just a more intelligent built environment, it also provides economic benefits and positive sociological impacts. The outcomes of this study are expected to advise policymakers at all levels in the industry on the need to adequately implement sustainable construction practices and policies for an improved construction environment. This study is also expected to provide information for stakeholder understanding and the collation of a body of knowledge in the subject area specifically in the construction industries of developing counties. For professionals, it is expected to stimulate interest in further reading and further research and development in the subject area. A policy being formulated also means that they must fill the individual gaps that exist in practice as it becomes mandatory for professional members to upskill their competencies in sustainable construction.

1.12 Contributions to Knowledge

Presently, there is little knowledge on standardised frameworks for implementing sustainable construction in peculiar environments especially in developing countries in sub-Saharan Africa. This study strives to add to the existing body of knowledge on sustainable construction development through policy initiatives and frameworks specifically for the Nigerian construction practice environment. Literature suggests that only a few such policy models currently exist in most developing countries and they cannot be generic due to the structure of each country's construction industry and government mechanisms. Thus, this development should, be a positive contribution to the body of knowledge for countries which fit into this framework.

Contribution to Practice: The expected input to practice at a national/regional and organisational level is to enable decision makers and regulators of the various professional bodies and organisations within the industry to improve their knowledge base and ensure growth in sustainable construction practice. At the Nigerian/national level, the study may contribute to the development of guidance and policy documents about how improvements and innovations in the construction industry could or should be arranged to give better sustainable outcomes. At the international level, knowledge learned from this study about policy and guidance about sustainable construction and management practices can be vital for other emerging economies in the developing world.

1.13   Structure of the Study

This study contains twelve chapters presented in a sequential and chronological order.

Chapter one provided the road map for the research study by providing the problem statement and the research questions, objectives, hypotheses and outline methodology of the study.

Chapter two presents a literature review on the advances in sustainable construction practce in selected developed economies and the visible underlying driving effects of policies towards the realisation of their targets.

Chapter three presents a literature based on the practice of sustainable construction in sub-Saharan Africa and the challenges and progress made so far by selected sub-Saharan African countries.

Chapter four presents an insight into the public policy making process and the reasons for sustainable construction discussions to come in through a stakeholder centric policy format as it affects basic sectors of the economy and challenges some of the existing cultural and socio political norms in the environment. It also discusses the possibilities of policy mixes as it relate to sustainability studies.

Chapter five discusses existing policies for the practice of sustainable construction in developing and developed countries and tries to have a comparative assessment of both backgrounds. It puts the noticeable gaps in focus.

Chapter six presents a conceptual framework for the development of a policy framework on sustainable construction in the Nigerian construction industry, drawing inferences from the literature review chapters.

Chapter seven discusses the research methodology and philosophical leanings of this study. It presents the basis for developing field work instruments and the research patterns adopted. Tools and methods considered for the study are expressed and limitations explained.

Chapter eight examines the rationale for the methodology, the organising and processing of the field survey and result outputs from the semi structured interview.

Chapter nine discusses the organisation of the second part of the qualitative field study, processing and result outputs from the focus group interviews.

Chapter ten discusses the results and data from the questionnaire survey from the construction industry in Nigeria, the descriptive profile of the respondents, exploratory factor analysis, confirmatory factor analysis, validation of the model and tests of the various hypotheses developed during the study.

Chapter eleven provides the triangulation of the mixed methods approaches employed in the course of this study, a robust discussions on the findings of the study and a synthesis for all the challenges and ideas concerning the efects of policies on sustainable construction practice in developing countries.

Chapter twelve discusses the conclusions and recommendations for this study. It also briefly discusses the suggestions for further research.

1.14   Chapter Summary

This introductory chapter provided an insight into the proposed study of the effects construction policies have on sustainable construction practice generally in both developing and developed countries. The need for improved policies to drive sustainable construction practice was also discussed. In developing policies, likely sustainable benefits, types and possible challenges that can be faced were highlighted. The problem statement of the study was outlined and research questions, objectives and hypotheses were formulated. The outline methodology for the research was explained and the ethical clearance and limitations brought to the fore. Contributions of this study to knowledge globally, nationally and within the construction industry and the significance of the study were identified appropriately. The next chapter provides the construction practice scenarios in selected developed economies and the effects of policies in their transition strategies to achieving efficient sustainable construction practice.

CHAPTER 2

SUSTAINABLE CONSTRUCTION POLICIES AND PRACTICES IN DEVELOPED COUNTRIES

2.1   Introduction

This chapter appraises global sustainable construction policies and practices in some nations at the forefront of the implementation of sustainable construction. The chapter starts by explaining the inputs of global agencies in policy making and facilitating sustainable construction through advisory policy making and linkages in countries. It then goes further by assessing Singapore, Germany, Denmark and the United Kingdom as models, investigating their regulatory mechanisms and implementation processes on sustainable construction. The chapter ends by briefly discussing trends and future directions such as the Agenda 2030, net zero buildings, smart cities and the relevance to effective policy making in sustainable construction practice.

2.2   Sustainable Development Goals and Implementation

The construction industry is critical in the realisation of the Sustainable Development Goals (SDGs) drafted together by the leaders of 169 countries in 2015 (UNDP, 2015). It is worthy to note here that the concept of Sustainable development captures all development that enables the present generations to meet current needs without depriving future generations the willingness to meet their future needs (WCED, 1987). This broad concept has since aimed at improvements in the materials usage and conservation of resources over the years. In line with this, Sustainable development goals (SDGs) are a series of global targets, bold commitments and frameworks arrived upon in 2015 by the united nations to ensure global goals aimed at development and economic prosperity are achieved more conclusively.

Some key global players are involved in realising these targets and some of them are discussed below thereafter, four developed countries that have progressed considerably in the implementation of policies and developments aimed at sustainable construction.

2.3   United Nations Environment Program (UNEP)

The United Nations Environment Program (UNEP) was founded in 1972 by the United Nations Conference on the Human environment in Stockholm Sweden as the need for monitoring environmental concerns became exigent. The UNEP has hence been striving to enhance economic growth and environmental protection. The UNEP FI (Finance initiative was launched in 1991) to drive financial organisations into the understanding of the linkages between economic sustenance, environmental protection, and sustainable development on oone hand and to catalyse the rapid involvement of the

private sector in these areas of sustainable development, especially construction (Willar, Waney, Pangemanan and Mait, 2020).

2.4   Organisation for Economic Cooperation and Development OECD

The Organisation for Economic Cooperation and Development OECD is an international and intergovernmental economic and social organisation of countries who run free economies and shape policies for better living and facilitate among policy makers and shapers to exchange ideas and forge progress along policy areas (OECD, 2020). With subsidiaries such as the OECD work on sustainable buildings, the focus of the OECD lies in suggesting how environmental impacts of construction can be reduced through reduced CO2 emissions, minimisation of construction and demolition wastes and the improvement of indoor air quality in the construction industry. OECD centre for green finance and investment catalyses transition programs and policies for its member states.

2.5   The International Finance Corporation (IFC)

IFC is a world bank subsidiary with some focus on partnering on sustainable development in developing nations. The IFC currently issues green bonds to countries and currently with over 93 projects in developing and developed countries (Banga, 2019). IFC promotes economic growth mostly through the private sector by working with strategic business partners that are aligned to the sustainable development goals. IFC invests in sustainable private enterprises in developing countries without the need for government guarantees.

These identified partners are important in the financing and implementation aspect of some the sustainable construction and general infrastructure financing especially in the provision of green bonds and securities. Bonds are a form of debt security issued to raise funds for specific developmental purposes and can be bought and sold between corporate entities. Green bonds in the same vein are defined as debt securities dedicated to raise funding for environmental projects which has in its scope covered the sustainable construction projects.

Studies by Agliardi and Agliardi (2019) and Park (2018) have shown that green bonds are becoming more popular with financial institutions and institutional investors and have received improved attention in utilisation for financing sustainable construction projects.

Sustainable Development Goals specifically, (6) clean water, (7) clean and affordable energy, (9) industry innovation and infrastructure, (11) sustainable cities and communities, and (12) responsible consumption and production patterns speak directly or in part to the construction industry as the construction industry is reputed to be a vast user of natural and existing resources in both its production process and in the lifecycle of its products.

Sustainable construction becomes useful as a template for realising responsible construction in terms of activities and processes, from the conceptualisation to the project delivery and post completion phases, while also considering the economic and social factors and the environmental impacts (Willar, Waney, Pangemanan and Mait, 2020).

Developed economies have progressed more actively in sustainable construction practice. This is partly due to the fact that developed economies provide better conditions to address sustainable built environment challenges and they have addressed the challenges over time (Shan, Hwang and Zhu, 2017). One of the other reasons attributable to this success include the government's structure and focus in line with sustainability and clear policy statements backed with regulatory provisions. The use of regulatory tools and policies for the promotion of sustainable construction is perceived as the most powerful and significant driver for realising specific developments and activities as a city or community can easily monitor the policy progress and penalise for non-compliance (Mensah, 2019). In realisation of this, it is expedient to benchmark advanced or developed countries in terms of sustainable construction to understand the required regulatory mechanisms. The sustainable construction practices of Singapore, Denmark, Germany and the United Kingdom are discussed below. These countries are selected as they have made recognised strides in their transition to sustainable construction practice (Shan, Hwang and Zhu, 2017).

2.6   Singapore

Singapore received her independence from the Britain in 1959. While briefly joining the Malaysian Federation in 1963, it departed in 1965. Singapore's small landmass and lack of natural resources led to the emergence of a developmental state that concentrated power around the central government. Singapore differed significantly from many Asian countries as environmental protection was incorporated into its urban planning goals as early as the 1960s (Han, 2019). Building Control (Buildable Design) Regulations were introduced in 2001 and they mandated building designs to achieve minimum buildability scores before the approval of their building plans could be secured (Siva, Hoppe and Jain, 2017).

The Singaporean regulatory code for residential and commercial/industrial buildings have always been mandatory and it applies primarily to all new building works. The energy performance criteria were developed and administered according to a points-based system that measured and prioritised performance. This allows a building owner to decide which energy initiatives should be included in as early as the design brief in order to achieve the 50-point minimum criteria for approval for efficiency. The codes include some mandatorily prescriptive elements for both residential and non-residential building types and these are clearly specified. The prescriptive elements include thermal envelope performance, HVAC efficiency, lighting, airtightness and sub-metering (Siva, Hoppe and Jain, 2017).

2.6.1   The Green Mark Scheme (GMS)

In the Singaporean construction industry, the Building and Construction Authority (BCA) launched the Green Mark Scheme (GMS) for buildings in January 2005 to impel the construction industry to promote environmental sustainability in buildings and encourage the application of existing various green building designs, technologies and innovations. Implementing the GMS realised recorded gains such as reduced cost from energy usage and water consumption, reduced footprints on the environment and noticeable improvements in the indoor air quality of workplaces. At the time also, the Singaporean construction industry was faced with performance and low productivity issues. With this background, the BCA continued to push forth sustainable developments through the green mark scheme and green ideas became more pronounced in building designs. It became imperative that building designs need to fulfil some established set of requirements and productivity expectancies assessed by the BCA before they could achieve the Green Mark certification (Kim and Yu, 2018).

In 2008, it was reviewed that building designs must achieve specific minimum green mark scores before their building plan approvals could be granted through the building control (Environmental Sustainability) regulations. The building code came into implementation in 2008 adopting largely the voluntary 2005 green mark criteria. The green mark points system encompassed several dynamic suggestions to facilitate the overall environmental performance of buildings. Such suggestions included the comfort and indoor air quality, alternative energy, waste reduction and reuse/ recycling, reductions in water usage, accessible public transport initiatives, and improved environmental management practice.

The success of Singapore in implementing the GMS can be directly linked to the role the government played in regulating and participating in sustainable construction through policies (Han, 2019). Investing in human capital development on sustainability in Singapore at various times when the need arose was also key factor from the government.

The Green Mark Scheme depended on the points attained and were classified into four grades namely Platinum (>90), Gold Plus (85 to <90), Gold (75 to <85) and Certified (50 to <75).

The Code identified five environmental impact categories that make up the scoring criteria. These are:
a) Part A –Efficient energy usage which itemised approaches that can be used for optimal energyuse in the buildings.
b) Part B – Water Efficiency which underscored water use efficiency during construction and building operations.
c) Part C – Environmental Protection which centred on design parameters and materials selection to

reduce the environmental impacts of existing built structures.

d) Part D – Indoor Environmental Quality (IEQ) which focused on design strategies to improve acoustic control, air quality, daylighting and thermal comfort.

e) Part E – Additional green features that focused on the adoption of innovative technologies that have potential environmental benefits.

Other notable regulations that are in place within the Singaporean construction industry include the Building Maintenance and Strata Management act (BMSM) 2004 and Workplace and Safety health Act.

2.6.2   Building Maintenance and Strata Management (BMSM) Act 2004

For the maintenance of existing buildings, Singapore keeps records of keeping existing building stocks very well maintained and serviced due to its strata management policies actively structured and maintained by the government over the years. As most buildings are not owned by a single individual or entity, strata-titled buildings are owned and managed by many individuals and entities. Due to this reason, it is more important that such buildings are adequately maintained to reduce dilapidation and avoid obsolesence (Low, 2011).

2.6.3   Workplace and Safety Health Act (WSHA) 2006

The Workplace Safety and Health (WSH) (Construction) Regulations 2007 provides for minimum occupational control within the industry and has been in operation since 1st January 2008. The Workplace Safety and Health Council took effect from 1st May 2007 and contained a list of codes of practice set in its schedule. The regulation defined the code to mean the Code for Environmental Sustainability of Buildings (2008) issued by the Building and Construction Authority in Singapore. The Code provided the basis for computing the green mark score as reported by (Low, 2011).

Singapore's journey in building control has been on and improving since independence in 1965. Noticeable changes and amendments have been implemented over the years to keep pace with new policies and technology requirements. The administrative processes have also evolved from a predominately paper-based process to an efficient information and communication technology (ICT) apparatus to operate more electronic platforms (Anggadjaja, 2011).

The construction authority has set a target of "*at least 80% of the buildings in Singapore achieving the BCA Green Mark Certified rating by 2030.*" (Siva, Hoppe and Jain, 2017: 2). Local authority enforcement, central government enforcement, applicants screening processes and post-occupancy evaluation and control have been the types of enforcement and highlights the pattern of authority for the effective management and enforcement of the sustainable construction process. Certification to drive the enforcement of the code during the inspection stages include the Energy Performance

Certificate Support Building Control, positive labelling for building beyond the minimum Building Control level, Energy offsets/Green Certificates and the HVAC system inspection document (Low, 2011).

On-site inspections occur through regulatory agencies during construction, commissioning and at the post occupancy stage of the building. Penalties for non-compliance with statutory regulations in Singapore exist and include monetary fines, refusal of permission to occupy or the refusal of permission to construct (GPBN, 2020).

Building regulations cover both building and construction controls. While building control components generally concern building designers rather than building contractors; especially as it concerns fire, health, safety and structural integrity of the building, construction control aspects legally relate to building contractors more than the designers particularly in the execution of construction activities (Buchanan, and Abu, 2017).

2.7   Denmark

Denmark adopted prescriptive building energy efficiency requirements in 1961 but by 1982 the first performance compliance option was included in the code. In 2005 the code was improved to be a full based performance regulatory document (Labansen and Bastien, 2019). Performance-based regulations sets performance goals and give room for individuals and firms to decide how to meet them within a certain time frame (Coglianese, Nash and Olmstead, 2003).

The latest code and supporting policy released in January 2011 incorporates many progressive and dynamc improvements which includes a mandatory computer modelling, air-tightness testing for all buildings, bio-climatic and intelligent design considerations, renewable energy requirements included in the calculation, well established boiler and HVAC testing systems. Denmark also has a national target of 75% less energy to be used in buildings by the year 2020 (Jentsen, Kristensen and Christensen, 2018).

Denmark's Building Regulation 10 (BR10) is a performance-based mandatory code that requires an energy frame calculation to establish maximum energy demand for residential and non-residential buildings. Enforcement of the current code began in 2011 and it is being managed effectively. The energy requirements are monitored by the Danish Energy Agency (DEA) while the construction regulations are supervised by the Danish Enterprise and Construction Authority (Labansen and Bastien, 2019).

Performance codes for new buildings are based on the Building Efficiency 10 'BE 10' software developed for the purpose. The performance process also considers life cycle assessment options. Enforcement is efficient and coordinated as it employs series of measures such as local enforcement by

the local authorities or municipalites, third party inspections, central enforcement from the federal government and accreditation of applicants. These processes are coordinated and synchronised to ensure efficient delivery (GBPN, 2020).

Physical site inspections take place during construction, at completion and delivery phases, and at the post occupancy periods to check the installed features. Compliance is measured and achieved to support the enforcement of the code through certifications such as Energy Performance Certificates, support building control, positive labelling for building beyond the minimum building control level, energy offsets and green certificates (Burman, Mumovic and Kimpian 2014).

Statutory retribution for non-compliance include refusal to occupy the building if the construction has been completed but violates statutory provisions and has been found to be inhabitable, or a refusal of permission to construct the facility until necessary provisions are complied with Herrando, Cambra, Navarro, de la Cruz, Millán and Zabalza (2016).

In line with the regulatory measures for construction in the Danish construction industry, additional measures supporting the enforcement include the commissioning requirements, air-tightness testing documents which are required prior to compliance, mandatory computer modelling, training of inspectors etc.

2.7.1 Green Building Council of Denmark

The Green Building Council of Denmark is a non-profit organisation established in 2010. The organisation works towards sustainability in buildings and the built environment. With stakeholders and players actively advising the government, policymakers and the industry generally on the exigency of boosting a coherent approach to building and environmental issues as it relates to the construction industry (Haugbølle and Raffnsøe 2019). The building council is rated as established by the World Green Building Council (WGBC, 2020).

2.8 Germany

Germany has had prescriptive building energy efficiency requirements since 1977. The first performance-based code was introduced shortly after the implementation of the Energy Performance for Buildings Directive (EPBD) in 2002 (Damm, 2006). The 2009 version and supporting policies encompassed improvements in many aspects such as, low to maximum u-values established with relation to the climate, mandatory computer simulation, air-tightness requirements, well established incentive schemes, frequent boiler and HVAC testing, robust Energy Performance Criteria (EPC) programs, voluntary low energy classes. The country also developed a national target and strategy for carbon free buildings by 2020 (Visscher and Meijer, 2007: Young, 2014).

Germany updated the "EnEV" (additional energy saving regulation). This document mandated minimum standards for all new residential and non-residential buildings. This version contained some strict regulations for new buildings and buildings subject to refurbishment compared to earlier versions and should therefore lead to improved energy efficiency in the German building sector (GBPN, 2020). These measures helped to ensure green initiatives became more transparent and accessible. This helps potential building buyers and tenants to make more informed and salient decisions. Germany however, does not rely on mandatory rules only. There are some other incentive schemes such as the "KfW bank", which is fully owned by the government and it facilitates reduced interest rates for buildings with improved energy performance. The German building code is participatory as it informs the general public and gives notices through its enforcement agents (Suttie, Hill, Sandin, Kutnar, Ganne-Chédeville, Lowres and Dias, 2017).

The EnEV is a performance-based building code which requires a mandatory (equivalent model building) energy frame calculation to establish the expected primary energy consumption of residential and non-residential buildings. EnEV poses requirements to the primary energy demand of new buildings. The structural heat insulation of the building envelope as well as the energy efficiency of the systems engineering used (heating system, ventilation, cooling, light) are considered by this energy demand. For the issuance of energy certificates, the ordinance refers to regulations that are published as official bulletins by the responsible ministries (Pedro, Meijer and Visscher, 2011).

The regulation addresses thermal envelope requirements and energy using or producing systems in the calculation, including, HVAC, hot water, lighting (non-residential only), bio-climatic design and renewable energy (GBPN, 2020). Due to the constitution, the legal framework for the enforcement of the Energy Saving Ordinance is a responsibility of the federal states. In the development of codes, stakeholders were actively involved, and the general public, adequately informed. The stakeholders were also retrained as regards the implementation of the code. The educational systems are involved in the knowledge transfer (Ascione, Bianco, Böttcher, Kaltenbrunner, and Vanoli, 2016). Certification schemes are in place to monitor compliance and the documents are freely accessible.

The enforcement status of the code is mandatory, and based on the accreditation of applicants. Onsite inspections are performed during the construction and post construction phases. Certifications that support the enforcement of the building code in Germany include, energy performance certificates, positive labelling for building beyond the minimum building control level, inspection of boilers, and the Services inspection (HVAC) system certificates. These documents are issued to developers and homeowners at different points of the construction process (Li, Kubicki, Guerriero, and Rezgui 2019).

Non-compliance is met with stiff penalties which include of permission to occupy and refusal of permission to construct the proposed facility until all terms are met. In order to ensure efficient enforcement, measures employed by the government include; mandatory computer modelling of the plans and the adequate training of inspectors is facilitated (GPBN, 2020; Pedro, Meijer and Visscher, 2011).

The Bundesinstitut für Bau-Stadt-und Raumforschung (BBSR) supports the supervising ministries in the improvements and amendment of the ordinance and in the design and development of technical standards and guidelines. The Federal Ministries concerned are also in close synergy to ensure the targets specified in ordinances are met. The government-owned bank Kreditanstalt für Wiederaufbau (KfW) group also plays a central role concerning promotion of energy savings and CO_2 reduction in the building sector. Between 1990 and the end of 2009 subsidies for at least 3.1 million homes were implemented. These included incentives and rewards to encourage people to go beyond the specified minimum level (Galvin and Blank, 2013).

2.9 England and Wales

Since 1976, England and Wales have had prescriptive energy efficiency standards for houses and construction works. However, the first performance based code was adopted in 2005 following the introduction of the Energy Performance for Buildings Directive 2002 (EPBD) (Rehm and Ade, 2013). In addition, the 2010 code and related national policies have further been strengthened to reflect the requirements of the EPBD which include, mandatory measurement and reference building of simulation calculation, air-tightness testing, thermal bridging and renewable energy requirements, pre-occupancy commissioning and a national target for all new homes to zero carbon by 2016 (Ogden and Walliman, 2006).

The Building Regulations 2010 Reservation of fuel and power in new dwellings (L1A) and in new buildings other than dwellings (L2A) comprise specifications that are mandatory performance-based codes and require an energy framework calculation to ascertain that the Design Emissions Rates (DER) do not exceed the Target Emissions Rates (TER) - measured in kg CO2 for a notional building of the of the same shape and size (Pan and Garmston, 2012).

The Department for Communities and Local Government (CLG) oversees the implementation of the EPBD in England and Wales. The code is set at the National Level. Owing to the climatic condition, heating based alternatives are the norm (Walliman, 2006).

Houses constructed over the course of the year to achieve zero net carbon emissions are exempt from stamp duty tax. Feed-in tariffs (FiTs) were also introduced since April 2010 for on-site electricity

generation from small-scale renewable electricity generating systems. These are some of the bonuses, incentives and rewards to encourage individual building owners and prospective builders to go beyond the minimum level of consumption. Display Energy Certificates (DECs) are produced by public authorities and public service institutions for large numbers of people occupying buildings with floor spaces exceeding 1,000 squared meters. Energy Performance Certificate are required to be submitted to building control before a completion certificate can be issued for commercial buildings (Lord, Noye, Ure, Tennant and Fisk 2016).

On-site inspections normally occur during the construction phase. Local enforcement is achieved through the municipalities and the accreditation of applicants prequalifies the process. Also, post occupancy control and assessments are done to check enforcements. Through a variety of media such as the TV, press, internet, radio and guidance information and documentation for prospective house builders, current house holders and other stakeholders, major publicity campaigns have been done in all parts of the UK. To ensure a smooth policy implementation process, regional governments also worked with professional bodies, trade associations and accreditation schemes (Walliman, 2016).

Certifications to support the code enforcement and performance enhancement include Energy Performance Certificate, positive building labels above the building control minimum level, Energy Offsets/Green Certificates, inspection of boilers and inspection of HVAC systems. Supporting labeling Schemes include the Building Research Establishment Environmental Assessment Method BREEAM's Code for Sustainable Homes and the BREEAM New Construction (BREEAM, 2016). The number of certified buildings currently exceeds eight million in England and Wales (GPBN, 2020). Specific regulations concerning commissioning requirements are in place to improve the enforcement of the regulations, air-tightness testing is also required prior to commissioning. The use of technology in mandatory computer modelling, and training of inspectors are effectively in place. Clients and stakeholders are well in tune with future targets far in advance and there is adequate collaboration in implementation of the targets (Ling-Chin, Taylor, Davidson, Reay, Nazi, Tassou, and Roskilly, 2019).

2.9.1   The United Kingdom Green Building Council (UKGBC)

With a mission to significantly and radically improve sustainability in the United Kingdom built environment, the United Kingdom Green Building Council (UKGBC) was formed as a non-profit, industry-led network in 2007. The UKGBC rserves as the voice of the industry in striving for innovative and long lasting transformation. Members of the built environment are inspired, challenged and empowered by helping the government, clients and users to identify and adopt optimally sustainable solutions in built environment needs delivery (UKGBC, 2019). The body also engages members in training and advocating a progressive message to government, informing and influencing policy

directions towards the realisation of climate targets, waste elimination and efficient utilisation of resources, promoting biodiversity and natural utilisation of ideas, prioritising and optimising the health and wellbeing of user and the environment in creating sustainable and viable options and generally improving the wellness of the citizenry (Baum, 2007; Zuo and Zhao, 2014).

2.10   Chapter Summary

A building regulation (also building control or building code) is a collection of rules that specify the minimum performance standards expected for built objects such as buildings and non-building structures. In order to obtain approvals and permits, buildings must comply with the code as observed from the discussions on the selected countries. Building codes are primarily intended to protect public health, safety and general welfare in the context of building and occupancy of buildings and adjoining structures. When formally enacted, by the appropriate government or private authority, the construction code becomes the law of a specific local area or jurisdiction (Halliday and Stevenson, 2005; Windapo & Cattell, 2010). In line with the discussions above, the building codes and additional documents of the discussed countries are performance-based and mandatory in application and the processes involved in the enforcement are not once off but a series of coordinated inspections tied to the progress of the works mostly at the local government or municipality level (Meacham, Bowen, Traw and Moore, 2005). This has encouraged compliance even before the introduction of the improved energy and utilities standards. Energy compliance and targets have only driven the existing process further.

Performance-based building regulations set performance targets for the product and allows the individual stakeholders and firms to decide how to meet them. If communicated adequately, it allows the innovation of the contractor (Halliday and Stevenson, 2005).

This chapter has assessed the inputs of a few global bodies and the policies and practices of sustainable construction in selected developed countries. The linkages with the government, status of enforcement and type of policies have been assessed. Trends and targets for sustainable development as it concerns the construction industry was also discussed. The next chapter shall focus on the sustainable construction practices and attendant policies in selected countries in sub-Saharan Africa.

CHAPTER 3

THE PRACTICE OF SUSTAINABLE CONSTRUCTION IN SUB-SAHARAN AFRICA

3.1   Introduction

This chapter relates an overview of sustainable construction practices in sub- Saharan Africa. It reviews of the level of practice of sustainable construction in developing countries generally in sub-Saharan Africa and narrows it down to the Nigerian construction industry as a whole by addressing current and past related works on sustainable construction strategies and policies. It looks at the attitude of stakeholders to existing policies within the construction industry of Nigeria and the possible helpers and challenges of sustainable construction in the Nigerian construction environment, taking into cognisance the effects of a change in policies in the industry. Knowledge earned from all the insights will assist in developing a conceptual framework for the adequate policy mix formulation and subsequent implementation of sustainable construction practice in Nigeria.

3.2   The Need for Sustainable Construction

The construction industry produces all the physical assets which form the crux of all aspects of development and a significant part of the human-made capital (Myers, 2016). The industry in itself and all allied industries such as building materials and manufacturing industries is a large miner and poacher of existing natural resources (Lubilo, 2018). These acts of exploitation have been ongoing for centuries creating damage to the resilience of the natural environment (Ochola, Sanginga and Bekalo, 2010). Construction activities contribute a great deal to the displacement of natural farming soil and agricultural land in many different ways through deforestation, increased erosion, new developments and infrastructure (Gomiero, 2016). The available native and tillable land is usually lost through these construction and construction related activities

The housing industry contributes considerably to the disappearance of virgin forests and wild lands by converting it to different other materials. This also leads to the loss of natural habitats and ecosystems (Enshassi, Kochendoerfer and Risq, 2015). This forest depletion is caused by the carefree use of forests for timber and furniture, sand for cement, concrete and glass and other different raw materials for construction. The utilisation of timber to supply energy for the production of building materials and coal generation, through the pollution consequences and aftereffects of construction processes and allied construction materials production activities all contribute significantly to the need for a cleaner and more sustainable approach towards construction processes (Chakravarty, Ghosh, Suresh, Dey and Shukla, 2012).

Furthermore, construction contributes globally to pollution and environmental degradation at all levels by creating pollution at the domestic level through dust, fiber, micro particles, toxic gases, fumes and emmisions from ongoing site activities and the production of construction materials (Kelly and Fussell, 2015). Construction contributes to the national or country specific pollution through emissions of noxious nitrogenous and sulphuric oxides in the production of construction materials and its reaction with the oxygen in the atmosphere. This adds to pollution on a global scale in two significant ways; the constant use and regular emission of chlorofluorocarbons (CFCs) in buildings throughout the total running life of the building contributing much to the depletion of the protective ozone layer, and by the production and emission of carbon dioxide and other greenhouse gases (carbon footprints) throughout the active lifespan of the building (Robbins, 2010). Carbon footprints measure the amount of oxides of carbon and other noxious greenhouse gases released or triggered into the atmosphere by an activity or housed and retained over the complete lifecycle or active livespan of a person, constructed facility or any physical asset (Jain, Gupta and Pandey, 2016).

The construction industry is a significant depleter of the world's non-renewable energy sources and minerals. Apart from its share of crude oil usage, the construction industry is a heavy consumer of several natural metals and alloys which have limited exploitable reserves remaining, notably copper, zinc aluminum and lead (UNEP, 2009). A continued acceleration of resources utilisation along existing unsustainable lines will make worse the environmental impacts, as some are already quite critical. Residential and commercial buildings contribute substantially about one third of green house gas emmissions in developed countries (Spence and Mulligan, 1995). Buildings are also responsible for over 40% of global energy consumption during construction and all through the active life of the building. Buildings within the European Union have been reported to generally account for 16% usage of potable water, 50% of resources and raw materials, 40% of wastes generated at landfills United Nations Environmental Program (UNEP, 2009). In the same vein, the potential for correction and reduction of these negative effects are embodied in the efficient designs, construction operational usage of green and more sustainable buildings and these are more realisable with adequate policies in existence and implementation (Rehm and Ade, 2013; UNEP, 2009).

3.3 Trends in Sustainable Construction

3.3.1 Agenda 2030

The agenda is designed for global planet safety and prosperity, to improve peace and reduce poverty. Countries and all stakeholders are expected to actively participate, collaborate and ensure adequate success in the achievement of the seventeen goals and 169 targets identified for sustainable development (UNDP, 2015). The global construction industry is poised to reduce its unsustainable construction

pattern now more than ever as it is a major consumer of natural and manufactured resources (Goubran, 2019).

3.3.2   Net Zero Buildings

A net zero carbon building is defined as a building that is highly energy efficient and fully powered from on-site and/or off-site renewable energy sources (WGBC, 2018). Recognising that in most cases, 100% net zero energy buildings are not feasible, energy efficient buildings and those whose supply energy needs come from renewable sources are more realisable targets for the mass scale action required to achieve agreed levels of global emission reductions. The GBCSA categorises the energy sources net zero buildings need into the following four categories: carbon, ecology, water and waste with each category having its own specific definition in line with the World Green Building Council WGBC (GBCSA, 2018). For example, a net zero carbon building is defined as one that is highly energy-efficient, and the remaining energy use is from renewable energy, preferably on-site but also off-site where absolutely necessary, so that there are zero net carbon emissions on an annual basis (Terblanche, 2019). Global agencies and indeed national governments are committed to reducing the primary energy demand of buildings by 80% by 2050. Achieving this reduction requires the most significant improvement in policy efficiency (Banga, 2019).

3.4   An Overview of Sustainable Construction Practices and Policies.

The practice of sustainable construction in developed countries is impressive but still faces peculiar problems such as adequate implementation and general coverage (Ofori, 2015). Studies such as Alsanad (2015) and Nwaokoro and Onukwube (2011) have recommended that the practice of sustainable construction in developing countries need to be enforced by government through specific strategic regulations and policies for it to be more understood and embraced by the practitioners within the industry.

Powmya and Abidin (2014) agreed that government is pivotal in the enforcement of regulations, revising extant legislation and policies, the introduction of building codes, incentives, and other financial instruments and initiatives to spearhead sustainable construction implementation. The lack of adequate commitment by the government hampers the implementation of sustainable construction as government must take the driver's seat for the adequate implementation success of these enforcements, especially in developing countries (Durdyev, Zavadskas, Thurnell, Banatis and Ihtiyar, 2018).

Djokoto, Dadzie and Ohemeng-ababio (2014) conclude the observations of other professionals and scholars by stating that policy formulation would propel the green building communities and sustainable movement groups by providing specific direction and clarity on the existing regulations or policies and modelling it as an agenda of the government's future strategy on sustainable construction. This policy

will help to bring the fragmented construction sector and its strategic stakeholders together to conceptualise a way forward for the industry.

Chan, Darko, Olanipekun and Ameyaw (2018) reviewed likely areas of government policy intervention in the promotion of sustainable construction especially for a developing country like Ghana as being represented mainly by seven critical barriers namely:

(1) the absence of localised green building rating mechanisms and labelling/certification programmes peculiar to the specific environment;

(2) lack of sustainable building regulations, policies and codes;

(3) lack of a body of knowledge for sustainable building skills and knowledge training for project professionals and staff on construction projects;

(4) absence of green building technology innovation, utilisation amd promotion by the government by not insisting on the use for government projects;

(5) lack of demonstration facilities and projects that depict sustainable construction initiatives;

(6) lack of local institutes and facilities for the promotion of research and development on green building technology and sustainable construction; and

(7) lack of visible government participatory incentives such as tax waivers and holidays, green building financing, green ideas patenting etc. These critical barriers cover issues within the capacity of government policy legislation and implementation.

Durdyev, Zavadskas, Thurnell, Banatis and Ihtiyar (2018) while studying the extent of sustainable construction practice in Cambodia, took a worldwide review at the practice of sustainable construction and concluded that there is a general similarity in both developed and developing nations. This similarity is premised on the attitude of the government to sustainable construction practices, and as such, each country must make its personal strategic agenda to entrench sustainable construction practices into its industry due to its idiosyncratic socio-economic-politic context.

The studies of policy formulation and implementation within the construction industry are mostly studies domiciled to countries and national boundaries (Ofori, 2000). This is because the output of the observed variables stem from government's role as a critical decision maker for the industry and the economy at large. These advances in knowledge create a nation-specific, industry-developed and owned efficient system to close up the identified gaps between the improved level of sustainable construction and the traditional paradigm of the construction industry. It is vital for future resilience and subsequent growth of the individual industry (Athapaththu and Karunasena, 2018).

How sustainable construction is being practiced in developing economies is quite different from developed countries because of many varying factors such as the low level of government's regulatory

inputs, the level of the policy documents for practice (Gunatilake and Liyanage, 2010), non-existent motivating and participatory financing options at the national levels (Chan *et al*., 2018), and the level of stakeholders participation in relation to coordination and formation of green building communities and councils for improving knowledge and knowledge bases in developing countries (Ude and Ude, 2014). Ogunmakinde, Sher and Maund, (2016) contend that the awareness of the general industry through professional practice and government policy on sustainable construction in developing economies is very low compared to more developed economies. The focus of government and the realisation that the construction industry delivers a foundation to the quality of life of its citizenry and serves as a base for the uptake of so many other industries is not pronounced. Government in most developing countries has not been able to operate in a balance with regards to its expected deliverables, and in most cases, there is no definite strategy or action plan on the ground to satisfy long-term plans and goals within the industry (Ofori, 2012).

3.5   Sustainable Construction Practice in sub-Saharan Africa: Current Situation & Issues

Years of unchecked explosive population growth patterns, settlement and migration have dramatically changed the landscape of the sub-Saharan Africna region. By the year 2025, the sub-Saharan Africa population is estimated to be more than one billion people. This rate of rapid population growth has led to an expansion of civil infrastructural capacity and social amenities in the built environment in other developed nations (Neumann, Vafeidis, Zimmerman and Nicholls, 2015). Ordinarily, this population growth should have led to an increase in infrastructural project planning and financing contributing immensely to the growth of the national economy. However, this has not been so for the sub-Saharan African region as it has been marked with less development in recent times due to lack of government direction and support and some other factors such as corruption and lack of adequate planning (Djokoto, Dadzie and Ohemeng-Ababio, 2014).

Government programmes alone, however, may not push the necessary changes expected in the building industry. Hindrances to a market transformation in most sub-Saharan African nations on budgeting and planning include the common practice of governments and institutions separating capital construction and operating funds rather than applying life-cycle budgeting (Kievani, Tah, Kurul and Habanda, 2010).The absence of government plans and subsidies to identify and mobilise rewards for sustainable practices and ideas is also a barrier. Government subsidies are appreciated in more economically viable nations like Canada, Europe and the United States. These subsidies and incentives immediately motivate sustainable practices at the organisational, homeowner and consumer (home user) levels (Halliday, 2008).

Studies have revealed that project developers and homeowners are ready to incorporate and invest in more sustainable techniques for their respective projects if the government is more attentive to their

plights for instance by introducing tax holidays or alleviation on constructing building projects more sustainably, cash rebates on energy saving appliances and vehicles and maybe introducing the concept of net metering (Abidin, 2010).

Government can also insist on having its own projects constructed in a sustainable manner (Miranda and Mirulanda, 2001). Investments in construction and other needed physical infrastructure in sub-Saharan Africa lags behind other regions of the world. There is an urgent need to tackle project financing and sustainability in the effort towards attaining the sustainable development goals and closing in on the infrastructural gap in sub-Saharan Africa as this creates an enabling environment for achieving success of project delivery (Bissoon, 2017; Lopes, Oliveira and Abreu, 2017). To work towards the actualisation of effective and improving sustainable construction practice, strategies and action plans must be laid and implemented for the sustainable development of sub-Saharan nations individually. Multi-stakeholder task forces in each sub-Saharan country, coordinated by the government of every nation and monitored globally through a support system (Usman and Khamidi, 2012).

To this end, a review of sustainable construction practices in most prominent sub-Saharan African nations namely Tunisia, Ghana, Mauritius, South Africa, and Nigeria (as shown in Figure 3.1) is presented. These are the countries currently with visible presence of sustainable construction practice in sub-Saharan Africa.

Figure 3.1 An image highlighting countries in Africa and selected countries (google image)

3.5.1 Sustainable Construction Practice in Tanzania

Tanzania is a sub-Saharan East African country with 365,756 square miles and about 6.4% of it is water. The density per person in Tanzania is 123 per square miles. Phoya (2018) reports while conducting a study amongst contractors in Tanzania that although there is acclaimed knowledge of sustainability concept amongst the contractors, there is meagre evidence of implementation especially in the aspects of waste management/ conversion and efficient resources (water) usage. The Tanzanian construction industry contributes around 8% of its Gross Domestic Product (GDP). The industry ranks fifth among all sectors that contribute to the GDP in the economy. The construction sector also directly employs about 9% of the total labour workforce in Tanzania (Kikwasi, 2011). Even with these contributions, the industry has been a significant source of ecological and environmental degradation and damage. Specific sustainable construction practices such as the application of water serving techniques as well as rain harvesting were ranked lowest indicating the deficiency especially in improving and greening construction site practuces in Tanzania (Reynolds, Waddington, Anderson, Chew, True, and Cullen, 2015). Phoya (2018) showed that there is a profound lack of realisation of the need to implement sustainable practices on construction facilities in Tanzania. Lack of understanding, perception and very low enforcement of existing building regulations were also perceived as factors which hinder the implementation of sustainable practices on construction sites in Tanzania. In line with Agenda 2030 of the United Nations, Tanzania's resolution captions 17 sustainable development goals (SDGs) which ordinarily stand as targets expected to be met by 2030 by all countries.

Indigenous professionals in the construction industry find it difficult to be in tune with both the globally set agendas and targets and the innovative rate of dynamic improvements in technology (Kikwasi, 2011). However, Tanzania depends mostly on the capacity of foreign multinational companies for professional services to manage large-scale building projects to solve the problem due to the inadequate number of professionals and acutely low knowledge of technology that Tanzania experiences. Since the requests and requirements for structures are very high, investors and developers are constructing without considering the necessary quality standards nor consulting the essential quality benchmarks. This has made Tanzania continuously face an increasing number of haggard, poorly maintained and dilapidated built facilities for its future (Hussein, 2011). Phoya (2018) noted that the adoption of western approaches to local issues and scenarios where local approaches might have achieved better results has always been a challenge in the industry. Hence, Tanzania has set out on a key strategic long- haul advancement vision 2025 that sets to develop local content and attain sustainable human living and development needs with the basic expectations for a middle-income level country by the year 2025. The needs distinguished as the fundamental impetus for the accomplishment of the Vision 2025 target incorporates the improvement of a framework as a vital fixing towards the acknowledgment of quicker

financial development (Sabai, Litchenberg, Cox, Mato and Egmond, 2014). There is no documented evidence of progress made so far in this regards.

The National Construction Council (NCC) established in October 1979 amongst other professional associations in Tanzania. It is an organ of the government and has since been in the forefront of the industry's drive for improvement in construction practices and services (Tanzanian Act, 1979). The government passed a policy on improved construction practices in 2003 which was being implemented by the Ministry of Works. A ten-year assessment review of the policy document was made in 2013 and sustainability issues formed a crucial part of its improvement and implementation. This assessment was instrumental in the establishment of the Tanzanian Green Building Council (TGBC) in 2014. The TGBC presently has a ''Prospective Status'' registration agreement with the World Green Building Council (WGBC) which indicates that the green building council is just inaugurated and is expected to grow in awareness and orientation of the general public and government policies towards sustainability in its construction processes (WGBC, 2018). The Construction Industry Policy (CIP) 2013 agrees with the fact that the essential requirement for active integration, development and performance of the construction industry is a framework which guarantees that the issues highlighted and identified will be brought into focus and solutions implemented to counter existing problems, weaknesses and constraints. It seeks a continuous improvement and capacity building for the Tanzanian construction industry.

Details and performance constraints identified by the Construction Industry Policy Tanzania (2013) include; the wasteful and decayed condition of the construction industry with poor execution effects affects the improvement of the economy. Shortcomings, issues, and requirements hampering the generation and development of the business include: low limit and ability of the neighborhood contractual workers and advisors because of feeble asset base and lacking knowledge. Insufficient and whimsical work openings, wrong contract bundling of works which support outside firms in giver subsidised undertakings, low open interest in framework ventures and over-reliance on giver financing. Inefficient and non - straightforward obtainment framework debasement and money related blunder in broad daylight/private parts. Lack of strong institutional components as far as money related credit offices, hardware for contract and expert advancement. Unfavourable benefactor contingent binds which have a tendency to minimize neighborhood development endeavors among others (Chileshe and Kikwasi, , 2013).

The world bank through its global and national intervention programmes invested in the Tanzanian construction industry through the International Finance Corporation (IFC), one of its subsidiaries. IFC has invested over $21.8 million in localising its EDGE rating platform, renewable energy projects, African Development Bank (AfDB), and providing green bonds in the Tanzanian real estate and constructioin industry (IFC, 2018).

3.5.2 Sustainable Construction Practice in Ghana

The republic of Ghana covers about 92,400 square miles in the west of the sub-Saharan Africa with about 5% water. Ghana has a population density of 263 people per square mile. Kissi, Sadick and Agyemang (2018) in a study of the challenges facing the pricing of construction materials that are deemed from cost professionals, revealed that the intent of the construction industry in Ghana among professionals (Quantity Surveyors more specifically) and policymakers is to adapt to sustainable construction practices. The construction industry of Ghana contributes increasingly to its gross domestic product (GDP) from 8.5% to 14.8% from 2010 to 2015 respectively; Kissi *et al*. (2018) concluded that awareness of sustainable construction challenge is a significant challenge affecting the pricing of sustainable construction materials in Ghana because there is no policy to the effect.

Dzokoto and Dadzie, (2013) also agree that the sustainable construction philosophy will be more successful if stakeholders like government especially being the overall regulator of the industry takes the lead by putting in place legislations that mandate corporate sustainability policies and the development of various policy instruments to enforce sustainability in all aspects of their processes. Dzokoto and Dadsie (2013) further pointed out that the government is a crucial stakeholder in the construction industry both as a regulator and a client, it needs to take up a significant role such as creating the conducive environment for effective implementation of sustainable construction.

The formulation and improved practice of sustainable construction policies in building and civil projects will reduce the generation of waste and improve living standards of citizens by using resources optimally (Atombo, Cudjoe, Dzantor and Agbo, 2015). In implementing these, contractors are major front liners as they implement the processes. Most construction firms in Ghana are expatriates and the domestic contracting firms need to increase their capacity, skill, and knowledge to ensure that sustainable construction practices get to all layers of the construction industry. As government efforts seem inadequate and deficient to solve the manageability challenges faced entirely, the construction industry may need to champion the lead in ensuring that environmentally sustainable construction practices are developed and adopted (Mensah, Ayarkwa, and Nani, 2015)

The Ghana Green Building Council (GHGBC) was formed on the 12th of August 2019 as a non-profit membership-based organisation interested and committed to helping to develop a sustainable community and industry in Ghana using improved best practices in energy efficient designs to construction facilities, water conservation and effective waste minimisation, resource management and cost-efficient value driven technologies and techniques in the design, construction and maintenance of the environment (WGBC, 2018). The primary goal of the council was the developing and transitioning of the Ghanaian built environment towards sustainability in the way and manner communities are

conceived, planned, designed, constructed, operated and eventually maintained and deconstructed when obsolete.

The council is also expected to champion the greening (retrofitting) of existing buildings. The GHGBC currently has a ''Prospective status'' registration with the World Green Building Council (WGBC) and is expected to grow within a defined timeframe (WGBC, 2018). The GHGBC council works with related government ministries in enshrining the philosophy of sustainability in the industry. However, a current vital challenge for the Ghanaian construction industry is the lack of a central stakeholder agency to regulate, coordinate and improve the industry at the industry level. Professional organisations can only strive to organise their members, and in most cases, membership has been optional and cannot be regulated (Ofori, 2012).

Efforts are being made to develop a Construction Industry Development Agency (CIDA) to further the continuous improvement needs of the Ghanaian construction industry and implementing sustainable construction (Ofori, 2010). Ametepey, Aigbovba and Ansah (2015) note that indigenous contracting companies have very little knowledge about the green building council and as such, there is a need to make themselves more visible.

Construction firms are always generally only inclined towards satisfying tendering and contractual requirements as their profit and business life depends on it. In the light of this, the renewal of the tendering conditions, processes and contractual provisions to include sustainabilty in the intrinsic demand is necessary for ensuring adaptation to environmental sustainable construction practice (Dastbaz, Pattinson and Akhgar, 2015). Regulations and policies exist as enablers of environmentally sustainable construction in developing countries. However, administrative activities and regulatory initiatives are not sufficient to solve the environmental problems faced in developing nations and especially on building sub-standard facilities.

Reviewing extant regulations is critical as existing government policies have fallen short of dealing with the environmental challenges associated with the construction industry's activities in developing countries (Ametepey, Ansah and Edu-buanoh, 2015). The existing regulations are not specific on the construction industry as well. The need is critical for the industry to take up active leadership roles through a coordinating body for the industry to ensure adaptation to environmentally sustainable construction practices (Howes, Wortley, Potts, Dodekorkut-Howe,Serrau-Neumann, Davidson, Smith and Nunn, 2017).

This lack of leadership and direction appears so as conformance to sustainability practices and principles seem to be lacking among construction industry practitioners in Ghana as there is no single

agency saddled with ensuring compliance of the practices, processes and principles. In developing countries, inputs from construction organisation businesses may be vital to making progress (Ametepey, Aigbovba and Ansah, 2015).

There is a need for the establishment of an industrial development board that will ensure an enhanced and vibrant construction industry and provide monitoring and tracking of contractor performance and where there are gaps, they deal with it (Ofori, 2012).

The absence of visible government strategic policies and support, non existence of building codes on sustainable construction philosophy and specifics such as sustainable procurement, contract management etc. can be addressed by the government's commitment to insisting that its projects are done sustainably through its developed frameworks, and the implementation of legislation to ensure that the private sector falls in line with its sustainability agenda (Ofori, 2012). Currently, government incentives and frameworks to promote and motivate the Green Building Technology adoption do not exist in Ghana. This lack of motivation may explain why the absence of government attention is perceived as one salient challenge to Green Building Technology's adoption in Ghana. In order to effectively accelerate sustainable construction adoption, it is necessary for the government to establish effective financial incentive schemes (Chan, Darko, Olanipekun and Ameyaw, 2018).

Due to the various identified environmental, social and long-term economic potentials and benefits inherent in implementing sustainable conceptualisations, designing, construction and management, government and its agencies must also spearhead the movement by gradually inputing sustainable design and construction deliverables, targets and practices into proposed government construction projects so that private organisations and individuals will follow suit (Ametepey, *et al.*, 2015). Driving challenges include but are not restricted to the lack of building regulations, strategic government ideas and policies for the industry, government support and development of measurement and evaluation tools amongst others (Djokoto, *et al.,* 2014).

The presence of local institutional facilities for research and development in sustainable construction will help improve the knowledge especially with regards to building materials and make processes locally sustainable. A vast gap exists however between grants specified for building-related research and development and that for research in other vital sectors in the ghanaian economy (Osei, 2013).

3.5.3   Sustainable Construction Practice in Mauritius

Mauritius is classified as a small sub-Saharan African country classified as a Small Island Developing States (SIDS). Mauritius has a limited land space with just about 2040 square meters, possesses a frail ecology and counts as one of the most densely inhabited islands in the world (with about 628 persons

per square km). It has a prospected range of about 140,000 new housing unit's requirements for the year 2020. This need creates challenges of growing demand for services like air-conditioning, heating, computers and electric equipment among other footprints and increased energy use in buildings which must be provided for (Elahee, 2014).

Critical barriers identified with implementing of sustainable construction in Mauritius include the absence of a shared common strategy on sustainable buildings delivery for the Republic of Mauritius among others (Hwang, 2011). Appraisal/permits and approval processes do not adequately appreciate sustainable buildings. The absence of building regulations to promote sustainable buildings, the lack of adequate government structure in terms of motivations and incentives for growth in sustainable construction practice. The existing building act sets no basis for the consideration of sustainable buildings, the inadequate or lack of proper enforcement of such existing guidelines and legislation. Lack of public awareness and client needs of green buildings. About 80% of all buildings in Mauritius are designed without architects and professional team advice. Other barriers include socio-cultural protection and resistance to improve the way building structures have been traditionally done, absence of scientific apparatuses and information to assess the financial advantages of sustainable structures (Hwang, 2011; Rambaree, 2013).

Continuous sustainable construction and retrofitting programmes in the Republic of Mauritania aimed at mitigating the identified critical barriers are captured in these frameworks such as the evacuation of constraints to energy efficiency and energy optimisation in buildings in Mauritius. The aim is to diminish Green House Gas discharges economically through a change of the construction vitality effectiveness showcase for existing and new structures (Glemarec, Rickerson and Weissbein, 2012).

Baguant-Moonshiram, Samy and Thomas (2013) noted that the national government played a vital role of establishing regulations, laws, policies, legislation and must also ensure that there is a clear will to implement the laws effectively from the top of the government to the bottom by ensuring compliance. These laws must pass through all public bodies in implementation and suggest a bottom-up approach as against a top – bottom approach. For a transition to a sustainable future, the global environment needs to focus on all spheres of development. The ecological footprint for Mauritius in the year 2010 was 4.26 gh/p global hectares per person. The ecological footprint measures the biologically needed amount of space (land and water) an individual, a location or country needs or competes for activity. African nations are well-placed to fashion new development pathways with their relatively low footprints, which are more sustainable than those taken elsewhere.

The Republic of Mauritius is a frontline member of the Small Islands Developing States (SIDS) community, and aims to lead the achievement of sustainable development within the SIDS community

as members face the same challenges in terms of the need for the optimisation of land and other land based resources (MID, 2013). In the light of this, the government of Mauritius developed a policy framework for sustainable development called the Maurice Ile Durable (MID policy) in 2013. It encouraged the Mauritian economy to improve performance and output of the economy. The implementation phase of the Maurice Ile Durable (MID) vision promoted the sustainable growth of the Republic of Mauritius and target a better and improved quality of life output for the citizenry.

The course of the Policy, Strategy and Action Plan turned to advocate a pathway and practical movements for the realisation of the Maurice Ile Durable vision (Mele, 2014). The policy exists with other ministries' regulations and techniques. The MID Policy, Strategy and Action Plan does not replace or supersede current guidelines and procedures, rather it complements them and improve existing regulations more especially where gaps and emerging challenges are observed. Based on the MID policy, the expected inherent roles on a contractor on a green project will include; recycling and efficient use and reuse of construction and demolition debris, limiting the use of noxious materials on the construction site, protection of the existing environment as much as possible, vegetation, usage of cleared trees for construction uses on site, securing environmentally friendly options in purchasing decisions and negotiations, and the procurement and installation of more energy-efficient mechanical and electrical systems and services (McConnel, 2010; MID, 2013).

The Green Building Council of Mauritius (GBCM) was formed in 2009 by a group of practicing entrepreneurs, clients bodies, researchers, construction experts and professionals in fields of sustainability and civic planning. The GBCM is a member of the World Green Building Council (WGBC). GBCM is a purely not for profit organisation commited to leading the construction sector of the mauritian economy into a sustainable future. It is involved mainly in the education and enlightenment of the general public towards sustainability options in construction activities (GBCM, 2009). There are no reports to confirm the evaluation of the MID policy in the Republic of Mauritania.

3.5.4 Sustainable Construction Practice in South Africa

The Republic of South Africa is the southernmost country on the African map with a total area of 471,455 square miles with as low as 38% of this area being the water composition of the country. South Africa has a population density of 110 per square miles. The prospect of a green economy is drawn from the laws and constitution South Africa. By 2008, plans for the transition of the economy was promulgated through strategic action plans, policies and frameworks to facilitate a smooth delivery. Notable among the policies which were reviewed was the NGP on economic development, the IRPE (Integrated Resource Plan for Electricity), and on industrial development, the Industrial Policy Action Plan (IPAP) (Cloete, Buckley, Godfrey, Hildebrandt, Makhafola, Pouris,vanzyl and Watson, 2014; Montmasson-clair, 2012; SANS, 2011).

The South African economy is highly carbon intensive and it is noted as one of the highest carbon intensive economies worldwide. Part of the transition arrangement was to also turn around the economy to a green market in these specific areas and as such be modelled as a clean technology leader. However, despite the excellent policy arrangements and the south african environment which has enabling legislations, the implementation and complete adoption of the transition to a completely green economy has not been very successful (Aigbavboa, Ohiomah and Zwane, 2017). Reasons identified for this phenomenon include the fact that the policy documents formulated made some assumptions that the financial capacity and capital, human and infrastructural resources to completely implement and execute the policies are intrinsically ready and in place for the smooth take off and efficient transition. However, this was not the case in most instances, this has created some gaps in the full take off of the plans (Aigbavboa, Ohiomah and Zwane, 2017; Cloete *et al.*, 2014; Montmasson-clair, 2012).

In South Africa, building structures represent 23% of the power utilised, and a further 5% in the assembling of development items. Numerous hindrances such as the attitude of clients, perceived increased costs etc. Aigbavboa *et al.*, (2017). restrain development and obstruct more viable utilisation of green strategies in South Africa. Conquering these difficulties require aids and mediations that help the green change.

South Africa can basically be said to have a favourable policy understanding on the issue of formulation of green initiatives and incentives, however, the implementation stage needs to be improved upon. Indeed, there is not a deficiency of relevant overarching national policies (Cloete *et al.*, 2014). All Government ministries and departments such as the Construction Industry Development Board (CIDB), Department of Public Works Department (DPWD) key into the Governments' regulation framework.

Aigbavboa, Ohiomah and Zwane (2017) realised that the attitude of the professionals in South Africa generally reveal that insisting on sustainable construction practices creates added costs to building projects and the fact that there is a general lack of realising the advantages of implementing the practice of sustainable construction amongst other hindrances to the adoption of sustainable construction practices. Practitioners viewed sustainable construction practices as capable of increasing costs and the need to make additional investments in planning, logistics, training, and retraining of personnel and staff to comply with the standards and requirements of sustainability. There is a need to change existing orientations within the industry.

The absence of funding and resources to support technological changes and growth on the side of local building owners (Clients), misconceptions of cost on budget inflations and a general lack of coordination of inputs and resources are implementtion challenges for the complete transitioning of the

construction sector of the industry as a part of the national economy. The study advised that construction professionals involved in daily construction processes actively need to educate their financiers and clients as regards the long term and short term benefits of sustainable construction practices. The active promotion of sustainable construction by government, the green building council of south Africa, non-governmental organisations, and educational institutions will greatly improve the practice rate in this field.

The South African construction market is ripe for green construction and sustainable practices but significant obstacles and strategic challenges such as low awareness and the interest to change exist in the implementation phase. These are expected basically due to the low attitudinal adjustment to change of development experts and the challenges of revising or improving construction regulations, data incongruence with respect to the relative outcomes, procedures and possibilities of green building arrangements, and money related hindrances. The study uncovered that there are deficient instruments set up for advancing green buildings development in South Africa. Respondents concurred that there is an absence of motivators for propelling green building this creates a disconnect in the ample implementation of sustainable construction practice (Simpeh, 2015).

South African regulations and relevant policies that affect and address buildings and the construction industry directly are discussed below.

3.5.4.1 The National Building Regulation and Building Standards Act

The National Building Regulation and Building Standards (Act 103 of 1977) outlines the principles and controls for energy efficiency in building structures. A revision to the regulation amended that every new building and expansions or improvements to existing structures must meet standard energy efficiency regulations in November 2011. The SANS 10400-XA is a national construction standard that sets the minimum requirements on energy efficiency and sustainable energy usage in the country. SANS 10400-XA establishes the minimum expectations and regulations that makes sure that energy usage in buildings is optimised as a resource from the design and conception stage through the as-built and occupancy/ usage stages of the facility. It captures the efficient usage of energy in fulfilling user needs such as vertical transport, lighting, hot water, thermal comfort and the building envelope. It also takes into consideration, occupancy, orientation of the building, shading and services as it involves various differing climates in South Africa. Energy demand varies in each climatic zone of the country and the SANS 10400-XA recognises that and incorporates it into the construction principles of the building.

3.5.4.2 National Framework for Green Buildings

The National Framework for Green Buildings (NFGB) of 2011 is a regulative policy that sets to declare the country's vision for maintainable built facilities and development that shows vital mediations to

recalibrate the South African development and property businesses (Van wyk, 2012; Windapo, 2012). The NFGB sets a year 2050 agenda for 80% reduction of thermal energy demands from buildings in the country. It also captures the deep retrofitting of existing buildings, energy performance certifications, net-zero energy buildings (nZEB), mandatory disclosure of energy performance, increasing stringency and compliance with building energy code and integrated renewable through the industry building energy codes. Implementation of the framework is expected to be carried out through the Department of Public works (DPW), the Department of Environment (DoE), GBCSA and other partners. Through this initiative, public sector clients are encouraged to build up to Green star SA ratings for improved quality delivery in the industry.

3.5.4.3 Innovative Building Technology Implementation Plan

The Innovative Building Technology (IBT) Implementation Plan of 2013 expects to propel the take-up of imaginatively improved construction advancements in South Africa and make a push for government participatory interest in a social framework development for IBTs within the economy (Manzini, 2015; Sibiya, 2018). The IBT implemetation plan is being championed by the National Home Builders Registration Council NHBRC as a palliative to the housing deficit in South Africa, and shift the focus from quantity deficit to quality improvement as well.

3.5.4.4 The Green Building Council of South Africa (GBCSA)

The Green Building Council in South Africa GBCSA was established in the year 2007 (GBCSA, 2015) to champion the transition process of the property industry of South Africa towards a green future. GBCSA has since achieved the coveted ''Established'' status of green building councils. This relates that the GBCSA has adequately satisfied the global requirements of the world green building council. The GBCSA is a dedicated team of sustainability professionals in the construction industry. The GBCSA works in collabortion with industry practitioners such as companies, industry institutes, policy makers in government, regulatory bodies, government departments and other professionals in the industry to develop a keenly competitive green construction environment with sustainable benefits (GBCSA, 2018; Windapo and Goulding, 2015; Windapo, 2015). The member based organisation sees to the promotion of practice of green building construction and sustainable construction practies in the industry. GBCSA also serves as a resource centre for development, training and certifying professionals on skills and knowledge in becoming experts.

The GBCSA promotes research and development in green buildings technology and also has developed rating systems and tools for the performance simulation, evaluation and measurement of designs, as-built facilities and retrofitting works. Tools developed to date include: the Green Star which aimed to provide objective measurement of the green building, net zero (Carbon, Water, Waste, Ecology) which aims to develop and certify buildings to meet no noxious emmissions requirements, the Energy Water

Performance tool (EWP), which is quite commonly used for benchmarking water and electricity in office spaces for upgrading basic requirements or retrofitting when the need arises for services upgrade (GBCSA, 2018). There is also the Excellence in Design for Greater Efficiency EDGE tool which serves as an online platform. The tool itself is developed by the International Finance Corporation and it offers measurable options to reduce the resource intensity of a building (IFC, 2016).

3.5.5 Sustainable Construction in Nigeria

The Federal Republic of Nigeria is a west African country with about 356,670 square miles with about 1.4% being water. Nigeria has a population density of 557 per square miles (NBS, 2018). Onuoha, Kamarudin, Aliagna, Oheahialam, Atilola, and Atamamen, (2017) relate that Nigerian construction industry policy development initiatives are still at a very early stage and are just evolving compared with other developed nations. Also, while there exists ample literature on green building the focus is not really on developing green building policies and skills in Nigeria. Onuoha *et al.,* (2017) realised that the perceived inadequacies in the Nigerian young green building industry is a challenge to the formulation and implementation of policies and programmes for sustainability in the construction industry in Nigeria. Central among other issues raised was the lack of adequate knowledge of sustainable construction amongst some construction professionals.

3.5.5.1 Policy Barriers for Sustainable Construction in Nigeria

Davies and Davies (2017) caution that there are gaps in all aspects of construction practice with regards to sustainable construction advocating that it should be brought into the industry through training and academics. Government policies should generally favour sustainable construction and energy savings knowing the impacts of both construction and living on the quality of life of the citizenry. However specific and minimum policies should be advocated, formulated and implemented in Nigeria. Akadiri *et al.,* (2012) asserts that if implemented, these policies should help the built environment become safer to work in, more efficient as there is a framework and desired strategy, and sustainable in terms of efficient service delivery to its clients. Presently, there are no such policies, regulations or professional councils or bodies to enhance knowledge in the sustainable construction domain and generally promote socio-economic and environmental sustainability (Mbamali and Okotie, 2012).

A total revisit and overhauling of existing planning and construction policies such as the National Building Code in Nigeria, a document which regulates performance standards for proposed design and construction works is urgently needed now. It should be noted that the presently used National Building Code of the Federal Republic of Nigeria was developed in the year 2006 based on persistent occurrences of building collapse at the time. A revised Nigerian Building Code for sustainable construction implementation and practice is crucial now to further incorporate improved and more sustainable ways of construction, especially for residential dwellings (Ogunbiyi, 2014).

3.5.5.2 Government as the Regulator of the industry

Ojo, Mbowha and Akinlabi (2014) while studying challenges of sustainable costruction practice at the construction firm level realised that government regulations dramatically encourages or discourages the adoption of innovation. The government sets the environmental rules for every trade and that the lack of legislation and policy is an extreme barrier for the practice of sustainable construction generally in the Nigerian property development industry. Government's silent encouragement of old practices through a lack of innovative trends in the industry and the non-usage of sustainable practices in government offices and on government projects is amongst other barriers realised to be of far-reaching consequences.

Low technical know-how and skills on sustainable construction, low awareness and insistence of sustainable construction techniques on sites and during construction processes by clients and enlightened professionals and lack of adequate expertise are percived as barriers to adequate implementation of sustainable construction (Bungwon, Dabo and Ishaya, 2018). This sector of the construction industry is in dire need of skills improvement and technology incubation (Afolabi, Ojelabi, Oyeyipo, Tunji-Olayeni and Amusan, 2017). Davies & Davies (2017) recommended that policies, regulations and professional guidelines on sustainable construction and development generally be taken very serious by the government as the consequences of not being proactive in this regard are dire. In Nigeria presently, lack of sustainability in construction projects is visible as there are still clear deviations from ideal sustainability dictates and principles. Infusing these principles are vital to improve the construction environment in Nigeria to avoid further building collapses and enhancement of capital and economic growths (Amusan, Ezewinwe, Osawaru, Joshua, Afolabi and Ojelabi, 2018). The government must adopt and enact policies as the regulator of the industry. This will encourage and promote standards, implementation of sustainable policies and ensure that erring professionals are penalised within the construction industry (Alkilani and Jupp, 2012; Ogunmakinde, Sher and Maund, 2016).

3.5.5.3 Government as a Client of the industry

The Nigerian government is currently the largest client of the Nigerian construction industry (Odediran, Adeyinka, Opatunji and Morakinyo, 2012). This is because government operates on many levels such as at the federal government level, thirty six states government level and 774 local government levels. There are also numerous ministries departments and agencies existing almost at every level of these governments (Umeokafor, 2018). The input of the client is quite strategic in the construction supply chain as the client may easily influence the construction process as the industry exists to basically satisfy its clients (Odediran *et al*., 2012). Akadiri *et al.,* (2012) argues that the client can influence and drive sustainable construction practice through improved client requirements. Government as a client of the

construction industry can therefore lead the process of sustainable construction being a large player and insist on sustainable public project delivery (Akadiri, 2012; Ametepey *et al.,* 2015b).

3.5.5.4 Construction Board and Collaborative Synergy within the Industry

The lack of institutions and an institutional framework for the assesment, review and control of the project management system and practice in Nigeria is also a noticeable challenge to efficient practice of sustainable construction within the industry. If taken care of, this should reduce impostors in practice from a professional practice perspective (Ogunde, Olaolu, Afolabi, Owolabi and Ojelabi, 2017). Oversight and regulatory functions need to be put in place for construction project management standards for the construction industry to safeguard and promote its existence through research and development (Daina, 2017) . The need for professionalism and teamwork to forge a common front has been stressed by various authors such as (Ameh and Odusami, 2010; Yakubu and Agapiou, 2016) this is even more needed for advancing sustainable construction practice (Valdes, Correa and Mellado, 2019). The need for a collaborative and strategic agenda and a construction board for coordination towards innovations and improved practice of sustainable construction in the construction industry of developing countries has been raised by several authors such as (Aniekwu, 2004; Ofori, 2010).

3.5.5.5 Localising Sustainable Construction practice in Nigeria

The advancement and fortifying of municipal bye-laws for some major key urban communities in Nigeria ought to be supported and energised as a result of their vital level of improvement. Governments at all levels (federal, state and local), through separate administrative organisations, policy advocacy groups and stakeholder units, are expected to play significant roles in this regard. Tunji-Olayeni *et al*., (2018) recommended the implementation of sustainable construction policies through the local government in Nigeria, all frameworks are necessary to be utilised in the realisation of sustainable construction initiatives. There are 774 local government headquarters in the country. Nwokoro and Onukwube (2015) noted that it is relevant to proclaim bye-laws for significant urban areas in creating nations since this will upgrade their vital strategic level of development. Governments at different levels should form regulatory bodies to play vital roles in stemming the negative effects of building collapse (Ogunbiyi, 2014).

Nigeria is not exactly short of legislation, but instead, they fail at the implementation stage. The 1998 Federal Environmental Protection Agency Act (FEPA) of 1998, the National Policy on the Environment Act (NPE) of 1989 and the Environmental Impacts Assessment Act (EIA) of 1992 are cited as examples of existing environmental laws to bolster this claim (Nwokoro and Onukwube, 2015). However, a need for revision of these laws is urgently needed and an improvement in the implementation framework (Aghimien, Aigbavboa, Ngcobo and Thwala, 2019; Dania, 2017). Nwokoro and Onukwube (2015) further stressed that urban areas have developed newer bye laws to cope with planning and population

limits as example in Lagos metropolis of the country which was the study area however, these municipal byelaws are not exactly green and sustainable and they need improvement .

3.5.5.6 The Nigerian Building Code

The Nigerian building code has beeen criticised as lacking in regulatory powers and with a very low implementation rate (Ogunbiyi, 2014). The building code is a prescriptive document that offers no consequences for its non compliance and is non regulatory (Adebowale, Adekunle, Omotehinse, Ankeli and Daniel., 2017). The Nigerian building code was never empowered to stipulate the minimum requirements of construction and infrastructure development as it was not completely embraced by all professionals within the industry and states of the federation ab initio (Oribuyaku, 2015). The Nigerian building code was initially designed to curb emanating issues of planlessness of cities, incessant collapse of buildings and fire incidents (FRN, 2006). The document was birthed in 2006, and was criticised as being alien to the industry as at the time of its formation as previous editions were never ratified for use in the country, hence, regulatory frameworks were not actually implemented.

The Nigerian building code has a section meant to acquaint users and professionals with its implementation processes which include the formation of an implementation unit comprising all built environment professionals at the smallest and all levels of governance in the Nigerian public space (FRN, 2006). However, the building code has not been put to use despite being drafted since 2006 owing to various penal obligations expected to be attached to defaulters which are not (Ogunbiyi, 2014). The standards spelt out in the building code stipulates the basic requirement from which other standards can be built. The scope specified by the building code covers all spheres of construction and initiates its synergy with the professionals on the Building Code Advisory Committee (BCAC). The committee (BCAC) is one in which all the built professions in construction are equally represented at the national, state, and local government levels. The committee when established should be answerable administratively and operationally to the Minister in charge at the federal level (FRN, 2006). An entire upgrade of the National Building Code that will ensure feasible development is pushed most particularly for private structures, monitoring of these projects will also be easier and accessible.

Oribuyaku (2015) envisioned a new sustainable code for built environment professionals and practice in Nigeria through a proposal for a vision policy framework. Nigeria is a member party to so many United Nations Framework Conventions but has not been able to maximise and internalise its membership of these global environments. Nigeria needs to integrate sustainability with economic development culturally. Government should rather develop the code through the private sector to mitigate the adverse effects of bureaucracy on the public sector. The study added that the building code should be given same prominence as the law as it stipulates the minimum requirements of construction works in Nigeria. The improved new code proposed should focus on mitigation issues rather than

adaptation standpoints as this is more likely to integrate sustainability culturally into Nigeria's economic development. The need for a revised building policy code from the Nigerian construction industry is further enunciated by (Amasuomo, Atanda and Baird, 2017) citing this phenomenon as a significant barrier to the lack of the development of performance assessment mechanisms for evaluation in the nascent construction industry of Nigeria.

Governments have the overall responsibility of nurturing the economy through the comprising industries. This can be harnessed through a performance based and locally monitored building code (Amasuomo *et al*., 2017; David *et al*., 2019). The government must drive corporate sustainability through legislation and benefits/penalties explaining that sustainability is not at the core of most companies that was comprised in the study sample. The study insists that the sustainability ethos must be culturally enshrined in the industry for there to progress in the drive for sustainable construction in the Nigerian construction industry (Oribuyaku, 2015).

3.5.5.7 Green Building Council in Nigeria

Nigeria got registered as a ''prospective member'' of the World Green Building Council (WGBC) since 2014 (WGBC, 2018). This membership has had no effect on the sustainable construction practices in the country (Adebowale, Adekunle, Omotehinse, Ankeli and Daniel*.,* 2017). There is no active green building council to further these interests and advise the construction clients appropriately on sustainable construction (Ude, Ogunsote and Ude, 2014). The sustainable construction activities and processes are not yet prioritised in the industry and the industry is fragmented. This has adversely affected the growth of sustainable construction practice in the Nigerian practice environmnent. These studies (Davies and Davies, 2017; Nduka and Ogunsanmi, 2015; Ude, Ogunsote and Ude, 2014) furthermore called on the government to institute a policy on the existing building codes and take advantage of the comprehensive assessment and design tool proposed. Tunji- Olayeni *et al*., (2018) and Adebowale *et al*., (2019) agree that Nigeria currently does not have a construction strategy/ agenda and firms and professional institutions only work according to their individual mandates and organisational preferences. Table 3.1 identifies the existing policy barriers associated with sustainable construction practice in the Nigerian construction industry. This timeline for this review is is limited to the past eght years only.

Table 3.1 Policy barriers identified from literature

Themes \ References	Amasuomo, 2017	Davies & Davies 2017	Mbamali & Okotie, 2012	Oeunde et al. 2017	Ogunjobi, 2014	Ojo et al., 2014	Onuoha et al, 2017	Oribuyaku, 2015	Nwokoro et al., 2015	Tunji-Olayemi et al., 2018
Lack of Policy Formulation on SC		*					*			
Adequate Policy implementation	*						*			*
Revision of Building regulations	*				*			*		
Private sector implementation of revised building regulations								*		
Strengthening Municipal laws on SC			*						*	
Lack of Adequate knowledge of practitioners							*			
Poor Government attitude to SC						*				
Institutional frameworks for assessment and review of SC				*						
Performance assessments and Green building council	*									
Regulatory rights to the revised building code	*							*		
Legislation through benefits/penalties for compliance/ default										*
Lack of Federal Govt synergy with other tiers of government										*
Policy implementation through the Local Governments										*

3.6   Chapter Summary

This chapter has tried to highlight various strategies and action plans employed in selected sub-Saharan African countries where there is evidence of sustainable construction practice. Starting with Tanzania, Mauritania, Ghana, South Africa and Nigeria. The patterns which these countries have employed in implementing these structural transitions and changes to their construction industries were discussed. The innovative and regulatory action of government policies on the practice of sustainable construction are also highlighted and the barriers were discussed. However, Nigeria seems to be lacking in the strategic arrangements observed in the countries discussed. This essentially brings out the main reason for this study which is to look at a way of bridging the gap through policies that will ensure that the practice of sustainable construction permeates the industry and brings desirable outcomes environmentally, socially and economically. The next chapter focuses on policies, types, effects and

various conditions that can assist in the formulation of a workable sustainable construction policy in the Nigerian construction environment.

CHAPTER FOUR
PUBLIC POLICIES AND SUSTAINABLE CONSTRUCTION IN DEVELOPING ECONOMIES

4.1   Introduction

This chapter shall take a look at agenda setting, policy development, the policy cycle, policy coordination inputs and the political requirements (inclusiveness) that will ensure effective policies are berthed into reality in democratic settings. The chapter will also explore ways of policy implementations, feedbacks and evaluation, and all policy characteristics that are relevant to sustainable construction in developing economies.

4.2   Defining Policy

The growth and development of any economy depends on the quality and strength of its policy framework (Hai, 2016). For developing economies mostly, this is tied to its short-term, medium-term and long term strategy. A public policy is defined as the underlying framework that captures Governments' decisions to realise public objectives and goals (Cochran and Malone 2005). Noting that a simple single definition may be tricky, key attributes of public policy can be discerned as: policy is being made generally in response to some sort of phenomenon or problem that requires public attention. Policy is made or decided on the "public's" behalf with the word ''public'' here referring to the general environment and its populace (Birkland, 2015). A policy is modelled or oriented toward an objective, a goal or desired state, such as the solution of a problem or the better understanding and thus interpretation of an unbecoming phenomenon (Thomson, 1998).

Policies are ultimately made by governments primarily, even if the conceptualisation and ideas come from outside government or through the interaction of government and non-governmental actors such as sustainablity being a drive from both within and outside governments in conceptualisation and innovations. Policy is understood, interpreted and implemented by public and private stakeholders and actors who have different interests, understandings, interpretations of problems, solutions, and their own motivations. Policies symbolise what the government chooses to do or not to do arrived at through a series of rational outcomes and extensive decision making. We can therefore generally define a policy as a proclamation or statement by the government of what it intends to do such as a law, regulation, ruling, decision, order, or a combination of these as it affects untoward phenomena or a genuine motivation to improve on the functions of government (Landau and Stout, 1979; Throsby, 2010). The absence or lack thereof of such statements may also be an implicit statement of policy.

A structural technical change in the economy or the need for it may be occassioned by the three attributes of change namely invention, innovation and diffusion (Redmond, 2003). It is a mix of processes that leads the economy to a fundamental shift. It involves technological, organisational, institutional, political and socio-cultural changes. The markets, systems, and institutions in the economy are affected by the effects of these structural changes and must respond through adaptability (Antoneli, 2014). Facing these challenges require improvements in understanding and a multifaceted approach to adaptation. A policy mix represents the alignment of several critical policy initiatives and instruments for decision making and improving innovations to sustain growth within the economy. In understanding the policy mix, it is imperative to go through the policy making cycle as it affects one's decisions in implementing sustainable construction (Rogge and Riechardt, 2016). Edmondson, Kern and Rogge, (2018) notes that such socio technical changes require a very complex mix of actors and stakeholders, institutions (academic, professional and research), artefacts, markets, infrastructure and practices. It also involves a level of politics. The basic understanding of public policy, knowledge is drawn from the existing fields of political science, economics, public administration, sociology and public policy.

4.3   Policy Processes: The Policy cycle

The policy cycle comprises stages such as problem identification, agenda setting, policy formulation, legitimisation and adoption, implementation, evaluation or assessment, policy adaptation, succession and termination (Mwije 2013). Policy making in itself can be seen as a series or cycle of problem solving attempts which gives way to policy learning through extensive decision making and modelling with real time simulation and experimentation of solutions to achieve the perfect fit (Rogge and Riechardt, 2016).

In discussions involving sustainability transitions, a policy mix concept is more desirable as it gives a broader scope and dynamic tools to achieve multi faceted objectives and outputs in an evolving setting or economy (Rogge and Reichardt, 2016). Researches such as Chan, *et al*., 2018, Djokoto*, et al*., 2014 have recommended the improved participation of government in sustainabile construction initiatives through policies and regulations especially in developing countries (Chan, Darko, Olanipekun and Ameyaw, 2018; Djokoto, Dadzie and Ohemeng-Ababio, 2014; Tunji-Olayemi, Mosaku, Oyeyipo and Afolabi, 2018). However, these studies have not gone further to explain what is actually needed holistically as regards policy mix or policy recommendations and regulations as regards sustainable construction practice in developing countries. Son, Kim, Chong and Chon, (2010) realised that active government policies played a very significant role on the sustainability profile and knowledge base of contractors in the construction industry. Figure 4.1 shows the different stages involved and is discussed further below.
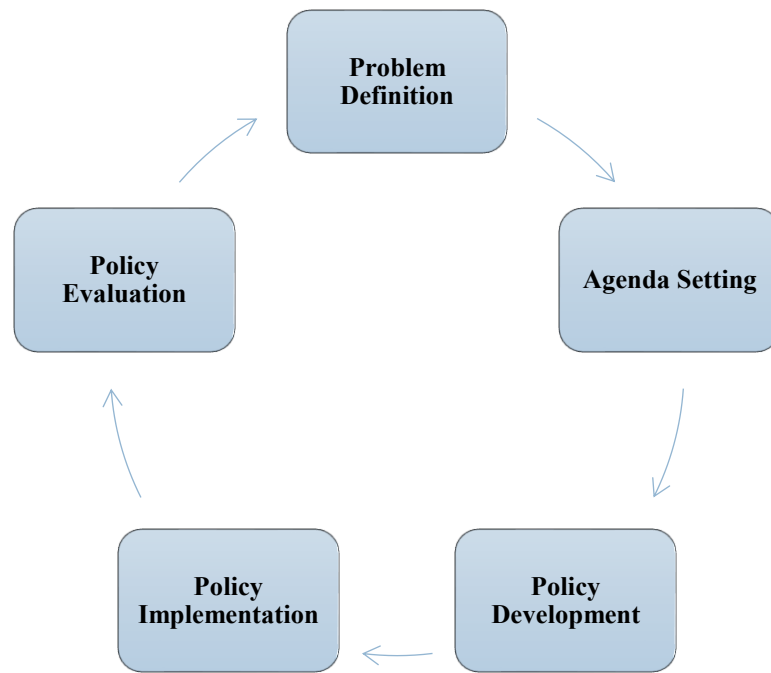
Figure 4.1. The policy cycle (Taylor-Smith and Lindner, 2010: 6)

4.3.1   Problem Identification

In policy making, a problem is defined generally as a gap between the presently existing state and the desired state. The existence of an unacceptable gap between normative ideals and present/ future conditions (Hoppe, 2002). The essence of policy making is to solve problems especially public problems. Policymaking is much wider than decision making as it involves a series of phases from the identification of the problem through developing a proposed remedy, implementing the remedy in real time and monitoring and feedbacks at each turn. The essence of feedbacks is to identify challenges if any regarding the implementation so as to forestall future pitfalls and make better the other elements of the policy process cycle (Dunn, 2015). A social problem is said to exist when a significant number of people believe that a certan condition is infact a problem (Kerbo and Coleman, 2009). A public policy basically sets to achieve a desired goal considered to be in the best interest of the society e.g clean air, clean water, safer houses and so on. As such, policy development is a decision making process that addresses identified goals, problems, needs or concerns. Policy development entails the pursuance of a desired objective or solution (Torjman, 2005).

4.3.2   Agenda setting in public decision making

In the theory of agenda setting, an issue will graduate from being identified as a problem, backed by the legal systems and the bureaucracy of government. Professional experts such as construction industry experts are rarely the drivers of the agenda setting phase. Largely, matters that come up on the agenda are based on the social construction of reality of the location. This phase of the policy cycle is often

given more prominence and attention by the media (Barkenbus, 1998). Agenda setting is such a crucial moment in the production process of policy making as it is capable of stalling the whole process and the proposed idea being ignored (Capella, 2016: 680; Cobb and Elder, 1971). Explaining the types of agenda setting as systemic and institutional agenda setting, it further explains that systemic agenda contains the set of issues that are considered very important by a group of people (society or professional group) and they are seen as matters under the governments' authority. They arouse the attention of the public opinion and some of the issues emanating from this agenda will attract the governments' attention. The attention (mobilising opinion) generated moves the issue to the governmental agenda (institutional).

The government or institutional agenda comprises the issues considered by the policy makers and decision makers at all levels of government. Issues generally emerge in small groups which is a subset of the society, these are then expanded to include more stakeholders and the issues are likely redefined in the process of its evolution. It is not out of place for some initial proponents and advocates may not so painstakingly support the idea as it was, when secluded.

Capella (2016) citing Cobb and Elder (1971) recognised three models for transition of issues from the systemic agenda to the governmental agenda Outside initiative model (where issues are initiated in circles outside of government and are refined as earlier explained first to reach the systematic agenda then to the institutional/ government agenda while the reformed group seeks the policy makers' attention. The mobilisation model is explained as one wherein the origin is from within the government, however, the public agreement is needed to ensure better participation during the implementation phase, as such, the bureaucracy routes it through the systemic agenda setting. The inside initiation model is the third model which actually also originates from inside the government however, it does not follow the systematic route. Public participation is mostly not needed or included in this model and it is often ideal for secluded government agendas such as military/ economic issues). These agenda setting models are very much related to the political system of government being practiced in the countries being studied (McCombs, Shaw and Weaver 2013).

Kingdon (2003) further reviewed the agenda setting concept to distinguish between the concept of government agenda and decision agenda. An issue materialises into being a part of the governmental agenda when it has the policymakers' interests and attention. However, not all issues will be considered immediately even on the governmental agenda due to the volume and complexity of these issues. Only considered issues will make up the decision agenda. The decision agenda is one which considers such issues to become policies through decision making by policy makers and formulators. Further, to distinguish between the government agenda (topics getting attention) and the decision agenda (topics within the government agenda that are for active discussion and decision). It was posited that a mix or

combination of three factors will affect issues at the decision stage and determine if it will be successful as a policy.

Figure 4.2 depicts the kingdon model. The problem stream explains the way the problem is viewed or perceived, the policy stream looks at the set of possible alternatives and the political stream which views changes in the general public opinion and political dynamics. The problem stream consists of some systematically produced indicators of government, some mechanisms and performance reports etc. and more especially some major events (disasters e.g. building collapse or large accidents, catastrophies such as flooding and ecological problems). These issues in themselves do not automatically transform them into the problem stream, rather, the interpretation of the events and the understanding that government attention is urgently required to forestall a reoccurence is what determines the success of the issue as a problem (Allutis, Krafft and Brand, 2014).
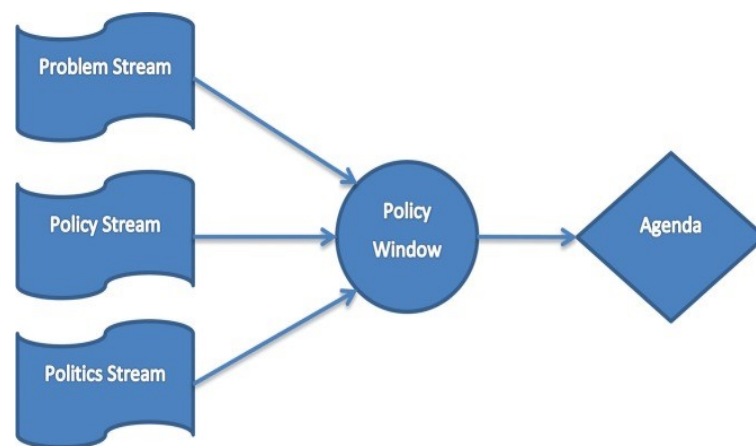
Figure 4.2. The kindgon model (Alluti _et.al.,_ 2014: 3).

The policy stream on its own consists of ideas relating to solutions, alternatives and directions offered by experts and practitioners in the field (researchers, practitioners, professionals, analysts, civil servants, interest groups etc. it is considered the available body of knowledge. Ideas generated may not be specific, as they often circulate through the community of experts, being refined through different paradigms. While some ideas are eventually discarded, some others survive and are actually put to use and considered by the government (Knaggard, 2015).

Finally, the political stream encapsulates the public opinon dimension (the public and general understanding on an issue), organised political forces (the opinion of intra government interest groups), and the government itself (government strategy and outlook in relation to the idea). On some occassions, there may be a convergence on the three streams earlier identified creating the possibility for a fast-

tracked change on the agenda, this phenomenon is known as a policy window. A problem is highlighted, the solution is very available and political situations agree that it is timely. When these policy windows or ''windows of opportunity'' open up, political entrepreneurs (individuals, interest groups, some top people in government, academia, media etc.) that recognise the system and tend to facilitate processes and unite the three streams to move the issue to the decision agenda (Allutis *et al.*, 2014).

Zahariadis (2003) tried analysing cases on the Kingdon model and realised that the model takes ambiguity as a nexus of the policy production process or that it follows an unidentified pattern and the ambiguity identified may be strategically manipulated and optimised to serve proposed benefits. This strategic manipulation and optimisation is identified as one of the key roles of the policy entrepreneur.

Baumgartner and Jones (1993: 29) relating from the review of all extant literature at the time, explained the agenda setting process with the ''Punctuated Equilibrium Model''. The submission explained that it is quite difficult to add a new issue to an ongoing agenda as a break from the status quo may not always be realisable due to the conservative nature of most political systems. There are stable times and also times which favor sharp and unexpected rapid changes. It is believed that a change in the agenda can occur only when the perception and objective of the policy is changed. The existence of policy monopolies being enforced by institutional arrangements limit the decision making process to a small cluster of people thereby restricting external influence (Baumgartner and Jones, 2015).

These monopolies promote the stability in the production of public policies and restrict the addition of new concerns and isues to the governmental agenda. However, there are few times new players or entrants gain some access to break some monopolies, creating an opportunity for a change in the agenda. This may be due to a change in the new entrants' perception or understanding of some basic fundamentals of the agenda or through changes in 'policy image'. A policy's image can be altered through many intra government political moves thereby affecting the public opinion and giving rise to a new or revised ideas and actors (Baumgartner, Jones and Mortensen, 2014). The authors posit that two key elements promote the stability the agenda setting process namely the predominance of an image and creating institutional arrangements to promote and support it sustainably thereby reducing accessibility from the other group. From the other end, however, a change in public policies is most likely due to unsuccessful strategies for mobilisation, inertia or blocking from other groups. This destroys the monopoly and promotes new ideas. This model has been tested in various fields and countries (Jones and Baumgartner 2005).

4.3.3   Policy formulation

Policy formulation refers to that stage of the policy process where options and alternative solutions that might help resolve issues and identified problems in the agenda setting stage are refined, defined,

appraised and formalised (Howlett, 2019). This stage is very crucial as it shapes the next stage which is the decision making stage. Policy analysts at this stage, decide on tradeoffs between the demands of the public and the capability of the government to address the demands. Policy formulation is perceived the essence of policy analysis as it brings to the fore manipulable means and obtainable objectives (Howlett, 2011).

The question of who formulates the public policy is next. This phase of the policy making process is mostly shrouded and inscrutable, however, many actors interact under political pressure and influence from special advisers, interest groups and policy entrepreneurs. It is also assumed that this stage is dominated by core politicians, specialists and those with prefereed access to decision makers, government agencies or departments even though their roles are hard to define. Initial studies of policy formulation by Cobb and Elder (1971) and Baumgartner and Jones (1993) tried to differentiate between analysts with political skill and analysts with technical skills and the generation and application of policy formulation tools (Radin, 2013). However, other studies such as Howlett (2019) and Turpenny, Jordan, Benson and Rayner (2015) have tried to examine who is generally involved in the policy formulation mix and processes. Policy formulation generally occurs in particularly designated venues.

Tools for policy formulation are not quite defined and at best are classified typologically. The first class consists of simple tools such as questionnaires, impact judgements, checklists etc. for siding expert judgements, More formal tools like cost benefit analysis, risk assessments, multi criteria analyses, scenario techniques these entail procedural and analytical steps and are classified as the second class. The third class of tools consists of the use of advanced tools such as computer based simulation modes and packages. Policy capacity is here defined broadly as the ability of the government to recognise, identify and pursue policy oblectives and achieve optimum success in its implementation to alleviate the needs of the public. Policy capacity oscillates between policy systems and governance levels within the same policy system. It affects the outreach and output of the policy. Another element to be considered in the formulation of policies is the intended effects the policy is expected to produce, both intended and actual. Substansive effects are those concerned with new means of achieving expected policy goals likely more obtainable with procedural and computer based modelling tools while procedural effects are also noted (Turpenny, Jordan, Adelle, Bouraris, *et al*., 2015).

4.3.4   Policy Legitimation and Adoption

Legitimation refers to the perception of the public in relation to its authority in policymaking with regards to specific policies. Since the public is the general body expected to be compliant with the policies. The legitimacy of a policy can best be measured by the willingness of the citizens to accept and implement it. It is therefore possible for policies to be rejected if generally perceived to be unacceptable especially in democratic settings (Park, Lee and Chung, 2015). Typologies are also

characteristic of classifying legitimation. Basically, the normative-moral and the cognitive component is identified (George, 1980). The normative normal reflects if the policy is rooted in societal norms and political values (desirability) while the cognitive components views the feasiblity of the policy. Scharpf (1998, 1999) proposed a two way classification as input and output oriented legitimacy. While input oriented legitmacy centres on establishing democracy and ensuring government's response to the needs of the people, output oriented legitimacy grows on the effectiveness of the government action delivering favorable and tangile outcomes, believing that a policy is good once it solves public problems and improves the good of society. Two way typologies for legitimation classification were generally critiqued as being not adequate for coverage and not leading to more success as envisaged (Hanberger 2003; Svara, 1998).

Legitimacy involves satisfying expected needs and solving forseen problems of various staheholders, it is vital therefore to respond to the needs of diverse opinion holders. Based on this premise, Park, Lee and Chung (2015) proposed a new three way typology of legitimacy capturing substansive legitimacy, procedural legitimacy and feasibility centred legitimacy. Substansive legitimacy bothers on normative aspects of legitimacy, the alignment of the various values and norms of stakeholders and the general public. Procedural legitimacy is the same as input oriented legitimacy wherein procedures aimed at involving participants and citizens inputs strenghten the process even if it slightly changes the government's agenda. Feasibility-centred legitimacy on the other hand slightly draws from the cognitive component of legitimacy. Feasibility-centred legitimacy concept plays three roles forward looking as a plan to action, presently as excuse and backward looking as an explanation. It is closely associated with output effectiveness which in turn claim legitimacy once they meet the needs of the people adequately and advance the common good (Park, Lee and Chung, 2015).

4.4   Policy Implementation

This phase puts the refined policy into action (De groff and Cargo, 2009). Implementation has always been seen as a distinct stage in the policy cycle as it transforms a policy idea or expectation to action and reality. This reality is the essence of the whole initiation of the idea in the first place, providing a remedy to specific societal problems (Khan, 2016). Public policies must have to be implemented and therein lies the success and beauty of the ideas as even the best policies (intentions) will be of little worth if badly implemented. In the discipline of policy studies, implementation phase suffers from a universally valid and viable theory or mechanism for delivery (Hupe and Saetren, 2015). These hindrances have limited the growth of this subject area in terms of theoretical advancement. Implementation is an ongoing, complex and interactive process. Policy implementation may not be static but dynamic over time for a number of reasons such as the nature of the policy process, content and context of the designed policy and actors iinvolved in the processes of implementation.These are

mostly outside the control of policymakers as they confront reality of implementation (Mthentwa, 2012).

4.4.1 Approaches to Policy Implementation

The top down approach/ rational or systems approach stresses the passion with which the implementation aligns and adheres to the intentions of the policymakers. Hierarchial and control flows and themes are often incorporated into this approach to improve performance and achieve the goals for which they are set for. The policy is taken as an independent variable and should be controlled by laws (Brynard, 2007). The bottom-up approach is a critique of the top-bottom approach. It argues that local implementers should adapt strategies to meet local needs. Implementers of this policy approach are known as street level bureaucrats (Mthentwa, 2012).

Bhuyan, Jorgensen and Sharma, (2010) proposed a framework outlining seven dimensions as shown in Table 4.1 that affects implementation namely: the policy content, formulation and communication, the socio-economic-political context of the policy, the leadership, involvement of relevant stakeholders, adequate implementation planning and effective resources start up, operations services and evaluations, and feedbacks and results.

Table 4.1 Highlighting the seven dimensions of policy implementation (Bhuyan *et al*., 2010: 5)

The Policy, Policy Formulation and Dissemination	Refers to the policy content, policy formulation process and procedures, the degree of dissemination. Are the goals, objectives and strategies clear and appropriate to be addressed by the policy? Do key stakeholders agree on the goals and strategies? Has the policy been disseminated to and understood by those responsible for implementation?
Social, Political and economic context	Recognises the various social, political, and economic factors outside of the policy process that can enhance or hinder effective implementation. Depending on the nature and scope of the policy, social norms such as gender inequality and governing processes such as decentralisation, inclusion and other factors that can affect policy implementation. The effects and consequences of these factors etc.
Leadership for policy implementation	Refers to the underlying knowledge that leadership and commitment are essential to ensure the follow through, resources and accountability needed for putting policies into practice. The attention of leaders responsible for policy formulation may be diverted once the policy is adopted or the responsibility for leading implementation might shift to new individuals and groups. How effective is leadership for implementation?
Stakeholder Involvement in Policy Implementation	Considers that policy formulation is increasingly a multi sectoral endeavor, yet this engagement might not continue during the policy imagination stage- thus it is crucial t consider the extent of stakeholder involvement in policy implementation and the nature of the relationships and collaboration among different stakeholders
Planning for implementation and mobilisation	Refers to the planning, resources and capacity needed to facilitate policy implementation. Does an implementation plan exist? Do organisations need new skills and training in order to implement the new policy? How will funding for new initiatives be ensured? How reliable is the resource flow?
Operations and Services	Recognises the coordination mechanisms operational systems and capacity of individuals and organisations charged with delivering services outlined in the policy. What are the positive changes the policy can bring? What are the challenges?
Feedback on Progress and Results	Considers the importance of regular meetings. gatherings, disseminating and using feedback to assess progress toward achieving results. Who is and who is not receiving information about implementation? How is the information being used? Are the perspectives of beneficiaries/ clients being considered?

The policy may either set out to improve existing conditions or may be entirely new in its implementation, at any point of implementation, the effects of adequate stakeholder management is crucial. Policies designed without stakeholder engagement are likely more difficult to implement as they neither consider the need of implementers nor the intents of those to benefit and sustain the policy (Klein & Knight, 2005). Also, policies developed to deliver specific benefits or result in new processes, programmes or operational guidelines must be adequately communicated and demonstrated so as to be understood by the implementers and users. For effective policy implementation, policy action should facilitate adequate communication and understanding as an underlying principle and should be based on stakeholder involvement (Bhuyan, *et al*., 2010).

Leadership and leadership style is also critical especially in a democracy. Consensus amongst leaders and critical stakeholders may affect the timing and degree of implementation. In most cases, policy formulators may not be implementers, for example, policies formulated at the national domain of a country will rely on state and municipal officers for adequate implementation. Critical stakeholders may include civil society groups and advocacy unions may serve as watch dogs and help in the policy implementation.

The inclusion of the private sector of the economy will also adequately enshrine the management on the people and remove the burden of implementation on the government and formulators. A one size fits all approach for implementing policies will likely not meet optimal outcomes as implementation involves the adaptation of a developed plan to local and real time situations, existing organisational flows and internal and external uncertainties (Paton and McCalman, 2008). Translation of policies into practice has always been a legitimate challenge in third world countries due to the negative impacts of poverty, political instability, lack of public participation as well as the cultural character of each developing country. These economic and political issues are to be adequately addressed at the policy implementation stage (Paudel, 2009; UNDP, 2002).

4.4.2   Policy Feedback and Evaluation

Monitoring and evaluation tools are essential parts of the policy cycle. The responsibility of monitoring and evaluation to generate feedbacks may be vested in a governmental or non governmental agency for proper implemenatation of specific policies. Adequate communication amongst stakeholders and timely monitoring and reporting ensures accountability and delivery of the policies. Similarly, there are specific indicators, milestones and paths earmarked for various signals in the implementation and feed back system (Khan, 2016). Corrective measures and steps can be brainstormed to suit local changes from time to time in the policy making steps through effective management of the stakeholders in the policy cycle. The impacts and effects of the policy on the citizenry are also measured and evaluated for better implementation and improvements for better policies in the future decision makings (Bhuyan,

Jorgensen and Sharma, 2010). Policy monitoring and evaluation is essential for feedback and improvement in the whole policy cycle process. It also promotes accountabiliy, enhances effectiveness and fosters overall equity and quality (Rogge and Reichardt, 2016).

4.5 Policy Mixes and Sustainable Development

A policy mix combines several policy instruments and includes the processes of their evolution and interaction (Rogge and Reichardt, 2016). In current studies relating to sustainability transitions, policies and politics, policy mixes have been called for as being able to enhance successful transitions as they are multi-faceted in various contexts such as technology and market systems. However, being a relatively new and evolving area, there is still much ambiguity in terminologies and definitions of terms (Markard, Raven, and Truffer, 2012; Rogge and Reichardt, 2016). Policy mixes are being increasingly referred to in scientific, enviromental economics and innovation fields (Flanagan, Uyarra and Laranja, 2011). In studies relating to sustainability, certain peculiarities must be considered as they affect real time situations and considerations. Policy mixes also have to undergo the policy cycle of identifying issues with a view to publicly solve them, the instruments and their interactions, also they are expected to be strategic in formulation and delivery (Kemp, 2011).

4.5.1 Ambiguities and Characteristics of Policy Mixes

In ex-ante and ex-post assessment criteria of single policy instruments, terms such as efficiency, equity effectiveness and feasibility are considered through the policy cycle processes. However for policy mixes terms such as coherence, consistency, comprehensiveness and credibility are more accustomed. Opinions are divided on the use of consistency and coherence of policies as some authors such as (Matthews, 2011) believe both words are synonymous and interchangeable, however, OECD (2001) and Mickwitz, Aix, Beck, Carss (2009) contrastingly disagree without a defining agreement. Other studies assert that coherence encapsulates a greater effect and coverage than consistency (OECD, 2003). Den Hertog and StroB (2011) agree that consistency is an absence of contradictons while coherence defines a call for higher synergy in purpose.

Policy strategy is identified as one of the components of a policy mix. It incorporates both policy objectives and the principal plans to actualise them (Rogge and Reichardt, 2016). Policy objectives identified with sustainability transitions may be based on ideas for the future defined by a time frame for delivery (Kern, Rogge and Howlett, 2019). The strategy may also incorporate social, environmental and economic components. Principal plans identifiable in the strategy for achieving sustainability may include government's capacity and guidelines, action plans and roadmaps which communicates the journey and steps to be taken to ensure adequate and timely realisation (Rogge and Reichardt, 2016).

Policy instruments are specifically tied with each goal in the policy mix in the same way policy strategies are defined by long term targets. Attributes of policy instruments include instrument type and instrument design features. Rogge and Reichardt (2016) opined that policy consistency relates to how the elements of the policy mix are well aligned with each other, as it contributes to the overall achievement of the policy objectives. It may span from the absence of contradictions to the existence of efficient synergies with and between components of a policy mix. It focuses more on the elements within the policy mix and how they work together to ensure objectives are realised.

Coherence of processes within the mix refer to systematic and synergistic policy making and implementation processes towards direct or indirect achievement of policy objectives (Glass and Newig, 2019). Policy coherence can be achieved through structural and procedural means like strategic communication, planning and coordination. Tools for improving coherence of policies include policy coordination and policy integration. Policy integration improves coherence by allowing a revised and holistic appraisal across different policy sectors, particapnts and processes. Policy coordination refers to how policies are integrated and managed to achieve desired the objectives (Kemp, Parto and Gibson, 2005). Therefore in policy mix development, the aim is to have maximum coherence with resources available and also striving to maximise consistency. Maximum coherence and consistency does not guarantee success in itself but serves as an input to improve policy mix performance (Kemp, 2011). Credibility is also a relevant criterion a policy mix is expected to possess to meet the expected performance level. It refers to the extent which the policy mix is likely to be accepted, believed and reliable. Credibility can be improved by a lot of factors such as political or government leadership, usage of the implementation mix or the level of authority given in stakeholder management of the policy mix.

Comprehensiveness of a policy mix addresses concerns about extensiveness and exhaustiveness of the policy. The degree of extensive decision making infused into the policy mix and the extent to which the instrument mix of a policy addresses system, market, institutional and implementation failures including bottlenecks, challenges and barriers. Comprehensiveness in the instrument mix may thus address systemic concerns, technology push and demand pull economics. Contrastingly, thoroughness, rigor and sturcture influence the comprehensiveness of policy processes. Comprehensiveness may impact the performance of a policy mix (Weber and Rohrarcher, 2012). Dimensions of the policy mix concept are classified in fields which may work for sustainability transition and include energy, climate, technology, environmental issues, etc.

4.6   Chapter Summary

This chapter focused on public policy making in democratic government circles as it relates generally to the need for action by the government. The chapter takes one through the policy cycle generally from

recognising an issue (problem identification) to agenda setting, policy formulation and the legitimisation and adoption of policies. These processes are very important for the successful implementation which transmits the solutions identified for the problem or structural changes needed into reality. The implemented policies are then evaluated through a feedback mechanism that informs better policy formulation and implementation of future policies. Various models under each phase are also looked at. Current research specifically in sustainability development and implementation point to the use of policy mixes as it is expected to bring about a structual change and it applies to a whole range of concerns in the industry and by extension, the economy. The next chapter looks at policy directions on sustainable construction in developing and developing countries and the implementation strategies of different countries.

CHAPTER 5

A REVIEW OF EXISTING POLICIES FOR SUSTAINABLE CONSTRUCTION IN DEVELOPED AND DEVELOPING ECONOMIES

5.1   Introduction

This chapter looks at the existing policies for sustainable construction generally in both developed and developing economies with a view to identifying if there are lessons to be learnt and gaps filled. Sustainable construction policies involve all stakeholders and phases of the project. Such policies create regulations, procedures, guidelines, notes and support programmes. These policies are expected to raise awareness and ensure compliance within the industry or economy which it applies. Policies take action basically from three levels namely; the policy level, the organisational level and at the project level. The success of the policy or building code generally is in the measurement and evaluation of its implementation. This study is going to focus more on the policy level of governance and its linkages with effective sustainable construction practices in developed and developing economies.

Some developed and developing countries where there are noticeable efforts to improving the construction practice towards sustainability have been selected for discussion includes: the United Knigdom, The United States of America, China, Srilanka, Korea, Ghana and Nigeria. The developed countries were chosen as they have demonstrated the capacity through literature while the developing countries were selected to highlight the noticeable trends in practice and identify gaps.

5.2   Developed Countries

5.21   United Kingdom

The Government of the United Kingdom (UK) made a series of strong commitments towards the climate change act. These policies have spanned through the whole economy, specifically affecting power, building & construction, industry (manufacturing), transportation, waste management and agriculture. These policies are enshrined in targets and projections instituted by the government in reduction of emmisions and carbon budgets within realistic timeframes (Bal, Bryde, Fearon and Ochieng 2013). The clean growth grand challenge policy aimed to halve energy use of new buildings by 2030, a policy on Renewable Heat Incentive (RHI) has been introduced to improve value for money and ensure long term heat decarbonisation, calls for energy performance certificates, future framework on heat in buildings and building markets for energy efficient products (Schleich, 2019). There are also calls for helping commercial buildings improve on energy consumption. Improving the current building regulations to incorporate energy performance standards, continuation of smart meter rollout to measure both electricity and thermal efficiency. For household heating, the UK introduced frontline boilers which are

more efficient, comfortable and controllable than precious boiling installations (Shan, Hwang and Zhu, 2017). These are aside from the various ongoing dedicated researches and implementation campaigns being promoted by the UK government. Although the implementation of these policies are not all at advanced stages, the government is committed to meeting its targets in a realisable timeframe (HM, 2018). The United Kingdom as a front liner in the global reach for sustainability launched a Green Investment Bank to primarily support green investment and overcomee barriers perceived at the time (Moncaster and Simmons, 2015).

5.22   United States of America

The United states government has addressed sustainability at all levels of government and has provided a lot of options for financing and helping its built environment achieve targets. Although the LEED system of certification is based on voluntary participation, government has made a number of policies to promote green buildings and sustainable construction generally. The policies are identified as mandates, incentives and symbolic gestures and are implemented at the federal, state and local/ municipal levels. Building and Energy codes exist basically at the state level (Matisoff, Noonan and Flowers, 2016). Institutes and associated organisations also have their codes drawn out and these are mostly adopted by the state governments examples being ICC (International Code Council) American Society of Heating, Refrigerating and Air conditioning Engineers (ASHRAE) codes for residential and commercial buildings (Sun, Brown, Cox and Jackson, 2016). Table 5.1 indicates the green building polices in the United States.

Table 5.1: Summary of green building policies across the U.S (Matisoff, *et al.*, 2016: 8)

		Impacted U.S. regions				Example locations	
	Common designs	States	Counties	Cities	Total U.S. population, %	State	City
Mandate	LEED/equivalent: government	24	30	170	57.77	VA	Honolulu, HI
	LEED/equivalent: residential	3	12	76	11.33	MN	Annapolis, MD
	LEED/equivalent: commercial	1	10	58	7.60	CT	Washington, DC
	GreenPoint/LEED checklist for permit	0	0	51	3.52	—	Atlanta, GA
	LEED AP required on design team	0	2	17	1.31	—	San Francisco, CA
Incentive	Grants for certification costs	5	1	14	22.60	NY	Portland, OR
	Property tax abatement, exemption, credit, rebate, or refund	10	10	11	21.08	NV	Salt Lake City, UT
	Fee reduction or rebate	1	10	46	9.16	OH	Las Vegas, NV
	Expedited permitting	1	13	48	7.97	HA	Chicago, IL
	Density (floor area ratio) bonus	0	3	54	2.70	—	Tampa, FL
	Publicity	0	2	18	1.19	—	Columbia, SC
	Height bonus	0	0	20	0.64	—	Pittsburg, PA
Other	Symbolic gestures	3	5	59	4.87	KY	Madison, WI
	Energy emphasis	34	12	42	66.72	SC	Fort Worth, TX
	Water or open space emphasis	0	2	10	0.53	—	Chattanooga, TN
	Multiple certifiers incentivized	17	14	83	46.15	IN	St Paul, MN
	Incentive tiered by certification level	3	8	37	9.18	OR	Nashville, TN
	Incentive tiered by building size	5	0	15	8.66	NM	Eugene, OR
	Incentive tiered by building vintage	0	0	2	0.02	—	Portland, ME

5.2.3   China

China on the other hand is industrialising very fast, the fastest industrialising nation on the planet (Deng, Yang, Tang and Tang, 2018). China urbanised rapidly from 26.4% to 52.8% between the years 1991 to 2012 and 12,856 to 45,566 square kilometers within the period (Deng, Yang, Tang and Tang, 2018). China developed three building codes to suit its three major climatic zones of hot summer, cold winter zone, and the severe cold zone. China made its codes on energy efficiency mandatory for occupancy of new buildings in 2007 with attendant roles and responsibilities of key stakeholders regarding compliance and the remedies for violation. The use of economic incentives such as subsidies, corporate income tax, fixed assets investments and value added taxes. Compliance is recorded to be above 90% as far back as 2010 (Sun, Brown, Cox and Jackson, 2016). Chang, Soebarto, Zhao and Zillante (2016) notes that due to her urbanisation drive, China became the world's largest emmitter of CO_2 and also the worlds' highest consumer of energy in 2006 and 2009 respectively. Hence the enormous challenge of having to balance her future urbanisation plans with efficient resources utilisation. This fueled China's urbanisation plan (2014-2020) aimed at incorporating ecological civilisation into planning and building new cities to conserve natural resources.

For China, transitioning of the economy is a structural issue that warrants various government policies to agree on mutually exclusive points, this will be faced with a lot of barriers in planning, conceptualisation and implementation. Elmualim and Alp (2016) found out that legislation is the greatest motivation for the implementation of sustainable practices in China, this view is also supported by Zhang and Zhou (2016) as regards carbon reduction regulations. Figure 5.1 highlights the model of for the chinese sustainable construction practice. It is highly regulated and supported by the government economically and through motivations for the industry.
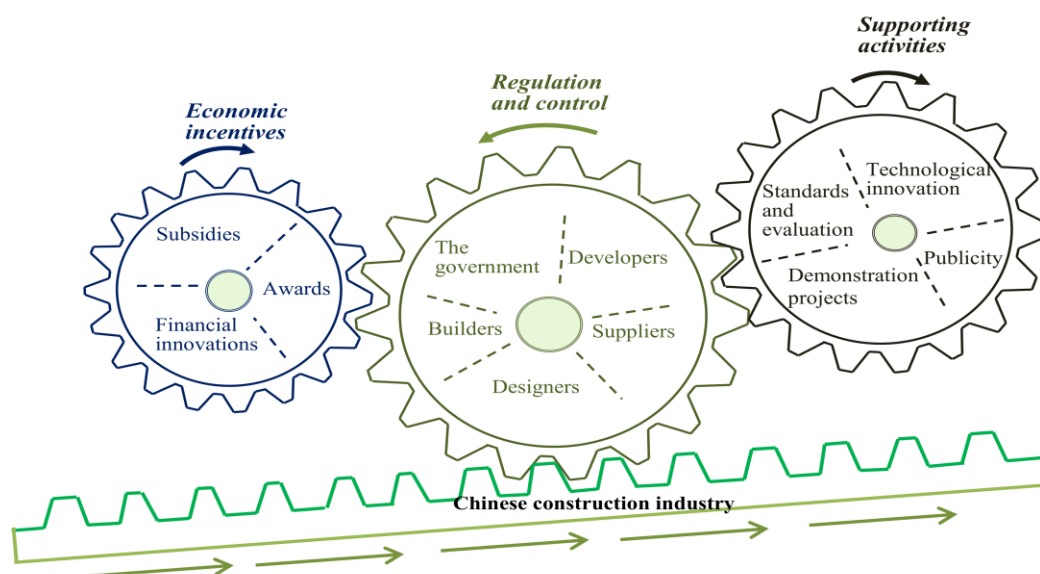
Figure 5.1 A policy gear model of sustainable construction in China (Chang, *et al*., 2016: 537)

China had twenty seven (27) policies concerning sustainable construction between the years 1998 and 2013. These policies directly affected designers, developers, suppliers and regulators of the construction industry in China. Other ways in which the government encourages and facilitates its mandate of succesful transitioning include; subsidies, awards and financial innovations, building demonstration projects, embracing technological innovations, standards and evaluation measures. The stakeholders and their control directives are identified in the table 5.2.

Table 5.2. Policy controls and regulatory expectations from stakeholders (Chang, *et al*., 2016: 538)

Key policies of regulation and control for sustainable construction.

Participants	Key policies of regulation and control	Policy source
The governments	• Must not approve project plans which are not in accordance with the compulsory energy standards.	Energy Conservation Law
	• Need to examine whether safety measures are planned by builders for the construction.	Administrative Regulation on the Work Safety of Construction Projects
	• The construction of unrealistic "image projects" and "achievement projects" should be forbidden and the actual economic and social conditions of cities must be considered in urban planning.	Circular of the State Council on Strengthening Urban Infrastructure
	• The governments above the county level are responsible for preparing and implementing a development plan of barrier-free environment for disabled people.	Regulation on the Construction of Barrier-free Environments
Developers	• Need to prepare an environmental impact assessment document for the proposed project.	Environmental Impact Assessment Law
	• Must arrange solid waste management facilities, which must be designed, constructed and put into place along with the main project.	Law on Prevention and Control of Environmental Pollution by Solid Waste
	• If the project has the potential to produce huge negative impacts on the environment and the public, the developers must arrange hearings or other forms of meetings to acquire expert and public opinions about the proposed project.	Environmental Impact Assessment Law
Builders	• Must effectively remove the construction waste they generate.	Law on Prevention and Control of Environmental Pollution by Solid Waste
	• The materials and equipment delivered to the construction site need to be checked to see whether they comply with the energy conservation requirements indicated by the design documents.	Regulation on Energy Conservation in Civil Buildings
	• Safety accountability systems and safety education systems should be established, and safety management personnel should regularly conduct safety checks and make safety inspection records.	Administrative Regulation on the Work Safety of Construction Projects
Designers	• Should obey relevant compulsory energy standards.	Energy Conservation Law
Suppliers	• The Ministry of Housing and Urban–Rural Development (MHUD) regularly publishes technology catalogues, showing which technologies in the construction industry are promoted, restricted or prohibited by the government.	Bulletin of Promoted, Restricted and Prohibited Technologies in the Construction Industry

The idea of institutionalising and implementing sustainable construction techniques through regulatory and non regulatory policies is clear and clearly articulated in China. Clients and developers are required by government who is the regulator of the industry that newly constructed or rehabilitated buildings in certain areas must meet certain sustainable performance evaluation requirements. At the local/city level, some municipalities have fully established such sustainable construction mandates. At the state level, some state governments have also required their public buildings to utilise certain green building ideas and techniques. Regulatory moves for the promotion of sustainable construction is viewed as the most powerful policy tool for promoting specific development activities, because a city or a state can easily conduct monitoring and disciplinary actions for non-compliance (Akadiri *et al*., 2012).

5.2.4   Sri Lanka

Athapaththu and Karonasena (2017) observed that a country-owned, industry specific system will guarantee better resilience in the future implementation and uptake of sustainable construction in the country. A development plan towards sustainability was conceived in the year 2007 by the Ministry of Environment and Natural Resources (MENR). So far, the level of sustainable construction compliance

is still low (Waidyasekara and Fernados, 2012). Although there is an observed increase in the demand for sustainable buildings, the local content of professionals and developers cannot fully deliver expected sustainable outcomes (Weddikkara and Devapriya, 2000). The Government needs to do more in making the industry more vibrant as it concerns sustainable construction. Organisational compliance was also brought to the fore and the impact of implementing sustainable construction ideals at the design stage. Client's demand and satisfaction and the need to fulfil all existing regulations made by the government were also observed as possible indicators to improve sustainable construction practices within the industry. The study proposed an all inclusive framework as identified in Figure 5.2.
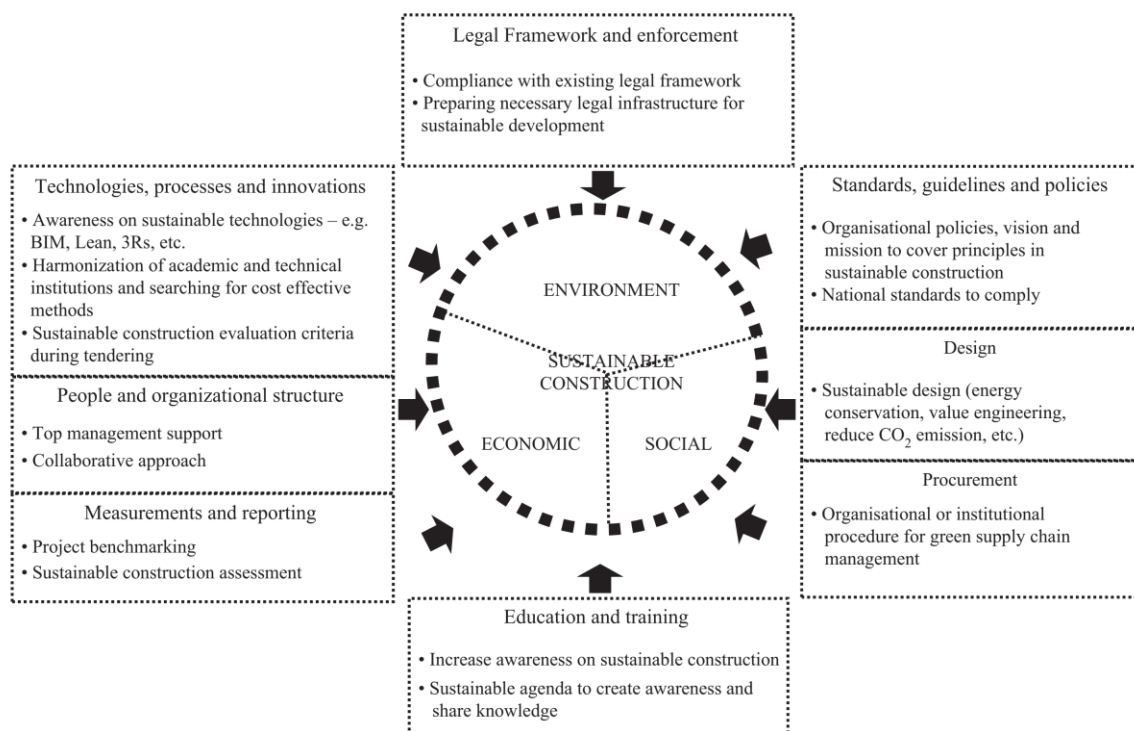
Figure 5.2: Framework for sustainable construction in Sri Lanka (Athapaththu and Karonasena, 2017: 59)

The framework proposes that the legal frameworks and enforcement be keyed with all inputs and people contributing to the industry through adequate standards, guidelines and policy. Also education and training on te sustainable agenda to creare awareness and improve knowledge base is key.

5.2.5 Korea

For the republic of Korea, Schuetze (2015) reports that the national agenda, Building Energy Efficiency Programme (BEEP) was initiated to optimise the energy usage efficiency of Korean buildings. Specific target values for the energy efficiency are set and well outlined in the building code and these will be part of the construction permit conditions. Furthermore, separate minimum design criteria for construction, machinery, electric facilities, and renewable energy are functionally described in the

building code. A building energy efficiency rating certification system for newly built or renovated residential apartment and office buildings is also instituted in the BEEP. The energy efficiency of specific buildings is assigned pyrimidically to different grades, from 1 (most energy efficient) to 5 (least energy efficient), based on the simulation of primary energy performance. The BEEP although introduced voluntarily in 2001, ten years later in 2011, a relatively small number of buildings had been evaluated. Because of the voluntary character of the rating systems, only 541 apartment complexes and 201 office buildings were graded (Schuetze and Hodgson, 2014).

Another part of the BEEP is a management system for Greenhouse Gases (GHG) and Energy Targets (ET) participation in the programme is compulsory for owners of buildings that emit more than 25,000 tons of CO_2 per year. The Korean building energy policy envisions the realisation of a low carbon, green society by expanding the green building sector. The goal is to reduce the GHG emissions of the building sector by 27%–31% by 2020 with the projection identified in table 5.3 below. The road map/ strategy to achieve this goal involves the following key points:

(1) Strengthening of building energy regulations and standards;

(2) Improvement of energy efficiency of existing buildings;

(3) Encouragement of building users' on energy conscious usage; and

(4) Development of green building technologies and infrastructure systems.

Table 5.3. Korea's National Energy Roadmap (Schuetze, 2015: 2754).

Year	2009	2012	2017	2025
Building energy efficiency category	Energy intensive house	Low energy house	Passive house	Zero energy house
Energy saving rate residential buildings	0%	30%	60%	100%
Energy saving rate non-residential buildings	0%	15%	30%	60%
Specific reduction factors	0% reduction of heating and cooling energy demand	50% reduction of heating and cooling energy demand	90% reduction of heating and cooling energy demand	90% reduction of heating and cooling energy demand
Applied improvement measures (building envelope and services engineering system)	7 cm thermal insulation, double glazing, high efficiency boiler	15 cm thermal insulation, triple glazing, mechanical ventilation with heat recovery	25 cm thermal insulation, high efficiency windows, LED lighting	25 cm thermal insulation, high efficiency windows, LED lighting, renewable energy production

The aim of strengthening both building energy regulations and standards is to reduce the heating and cooling energy demand of buildings. For example, the maximum u-values for windows and doors have already been minimised. The upper limits have been reduced from 3.84 W/m2K in 2001 to 3.0 W/m2K in 2008, to 2.4 W/m2K in 2010, and to 1.5 W/m2K since 2012. In essence, the installation of items for the reduction of the cooling energy load, standby power programmes, LED lighting, and highly energy efficient appliances need to become compulsory. In the future, building permit systems will likely be

based on the evaluation of a building's energy demand, and should require net zero energy performance for all new buildings in the Republic of Korea. However, to achieve the goal of such a significant reduction of the overall energy consumption of the building sector, not only new buildings but also the energy efficiency optimisation of the existing building stock needs to be addressed (Zhang, Zhou and Choi, 2013).

5.2.6   Ghana

Building regulations in use in the western part of Africa has been in existence since the 1940s and being implemented by the municipalities. The document was later improved upon by the then West African Building Research Institute (WABRI). The Ghanian construction industry further reviewed the code under the Building and Road Research Institute unit also known as the Council for Scientific and Industrial Research (CSIR) (Ofori, 2018). Due to changes in land use patterns, materials, construction methods and the municipal/local government structure, the National Building regulations of 1996 was produced. The current draft of the building code is the 2012 version which was put together through the ministry of water, works and housing, funded by the UNDP and overseen by the National Disaster Management Organization (NADMO) in Ghana. The 2012 version has modifications that specifies minimum standardised materials for use in construction and a new section on building services, energy efficiency and sustainability (Parts 9, 10 and 11 respectively).

A 2019 revised building code is currently underway in Ghana and it is expected to take sustainability and sustainable construction into more focus as earlier versions of the building code do not have the considerations for sustainabilty defined (Offei, Lengoiboniand and Koeva, 2018). Implementation has been through the district planning offices situated in each municipality. While these documents are available, the implementation has been a big challenge. Ametepey, Ansah and Edu (2015) noted that attention only comes to the building code when there is a disaster waiting to happen or that has just happened. Noting that drivers of adequate implementation include corruption, bureaucratic tardiness in government offices, inadequate staff and facilities for implementers, also a lack of the public knowledge/education about the building regulations, experience and ambiguities of some parts of the Ghanainan building code. Access to building permits and approvals remains one main indicator for the ease of doing business in countries, recommending one stop shops and input of fast tracked technologies to cut down the bureaucratic and corruption drivers and adequate education to curb the awareness challenge (Ametepey, Ansah and Edu-Buandoh, 2015).

5.2.7 Nigeria

Rising from the pre-independence/colonial construction practice and the subsequent West African Building and Roads Research Institute (WABRRI) in the Nigerian construction industry in 1987, the Nigerian council of works and housing directed all stakeholders in the industry on the need for a building code and hence the need for their inputs (FRN, 2006). Despite a successful draft completion in 1990, the document was not ratified by the Federal Executive Council for use within the country (Dahiru, Abdulazeez and Abubakar, 2012). The draft document was later re-presented to the reconstituted National Council on Housing and Urban Development in 2005, where in the Council directed that the document be sent across to professional bodies and stakeholders for their structural inputs and improvements. The structural change incorporated the realities of urbanisation and the challenges therein and also dedicated a whole part to the enforcement of the codes through a convenient classification into project requirement and enforcement stages viz; pre-design, design, construction and post construction stages. However, the document was never adopted (Ogunbiyi, 2014).

The urgency for the evolution of the building code was borne out of the following needs; the planlessness of towns and cities, the incidents of building collapses, fire infernos and other disasters, the lack of referenced design standards for professionals, quackery, lack of adequate tests and materials usage and the pervading lack of a maintenance culture of the various built facilities within the country (FRN, 2006). The document was launched in the year 2006, however, the implementation has been very low due to a lot of issues namely that professionals are divided on the opinion whether the code as approved is a law as it stands or needs to be promulgated/ pronounced so by the National Assembly (Ogunbiyi, 2014). Also, if it is a law, what are the penalties for default or contravention. This ambiguity and a lack of professional coordination to seek direction and monitoring are a main deterrent of the adequate implementation of the code (Oribuyaku, 2015).

The National building code stipulates that a Code Enforcement Division/ Unit/Section shall exist at the Federal/State/ Local Government comprising all built environment professionals, fire officers and public health and safety officers to administer the dictates of the code at the different stages of the construction works (FRN, 2006). As the building code was never adopted, this implementation mechanism was never put to use. Sustainable construction as a concept has not been infused into the Nigerian building code (Davies and Davies, 2017). Calls for a review of the building code due to the inadequate implementation of the existing code and the fact that the disasters such as collapse of buildings and infernos in buildings have not abated (Oyedele, 2018). The government is contemplating making some revisions however, it is not yet clear what revisions will be made as regards the inputing of sustainable construction initiatives and the improvement of the modes of implementation so as to ensure that it becomes the official document specifying the minimum building standards in the country (Geissler and Macham, 2018; Oyedepo, 2014).

5.3   Chapter Summary

This chapter looked at the sustainable construction policies in developed and developing countries with the implementation strategies of the countries and the roles of government in both the planning and actualisation stages. The next chapter intends to develop a conceptual framework from the knowledge gained from the reviews of these topics on sustainable construction practice and policy formulation

CHAPTER 6

A CONCEPTUAL FRAMEWORK FOR IMPROVED SUSTAINABLE CONSTRUCTION PRACTICE IN NIGERIA

6.1   Introduction

This chapter presents a conceptual model for improving sustainable construction practice in Nigeria through a public policy view. The conceptual model is discussed, and hypothesized relationships are outlined.

6.2   Conceptual model for improved sustainable construction practice through the implementation of public policy view

A model is a scientific representation and can be viewed as one that endeavours to characterise reality (Fellows and Liu, 2015). Hair, Black, Babin and Anderson (2010) relate that a conceptual model should show a simplistic representation of the relationship of a set of variables being studied and it does not necessarily need to be complex and detailed. In the field of construction management, models can be presented in graphical formats or mathematical expressions (Fellows and Liu, 2015). This research employed a structural modelling approach to represent the model in a graphic and visually comprehensible form in the development of a framework.

6.3   The selection of the dependent variable

The perils associated with not having sustainable construction practices entrenched in the Nigerian construction industry was discussed extensively in chapter 3 and 5, the advantages and the reasons for the selection as the major dependent variable will be discussed briefly below. The dependent variable is the variable being tested in a scientific experiment. It is dependent on the independent variables (Tabachnick and Fidell, 2013).

A sustainable construction industry delivers a more improved quality of life for the citizens as there is active government planning and monitoring. Stakeholder involvement also is key as the synergy among team players propel the industry to deliver on its mandate of quality infrastructure to the government and citizenry (Akadiri, Chinyio and Olomolaiye, 2012). In ensuring the deliverables of sustainable construction to the industry, end users, clients and the general public must be made to understand the improved differences sustainability of infrastructure will promote and the various inputs expected of their class of membership of the construction industry (Fewlings and Henjewele, 2019;Lim, 2008). Hence, the implementation phase of sustainable construction policy should actively encompass municipalities and local governments as they are generally closer to the people (Miranda and Marulanda, 2001).
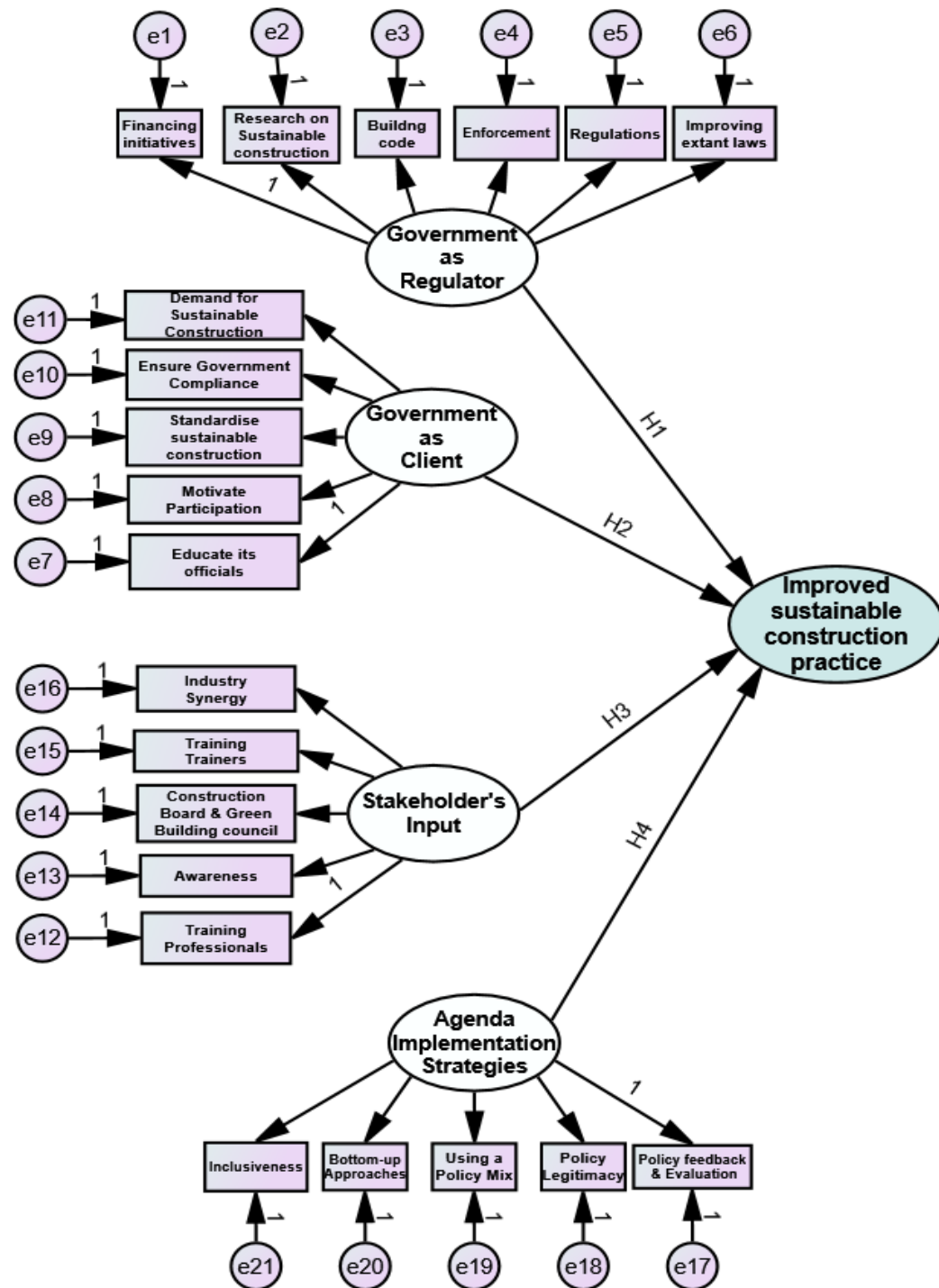
Legend: e1-e21- error terms, GAR- Government as Regulator, GAC- Government as Client, SI- Stakeholder's Input, AIS-Agenda Implementation Strategy- First order CFA components, ISCP—Improved Sustainable Construction Practice--Second order CFA component

Figure 6.1   The Proposed Improved Sustainable Construction Practice conceptual model.

Bell (2002) and Van de Waldt (2016) studying the role of government in promoting sustainability note that the role of governments is changing towards sustainability and sustainable construction from policy development, regulations, facilitation and internal sustainability management. Alsanad (2015) and Alkilani and Jupp (2012) suggested that government as a regulator of the economy should revise existing regulations and guidelines and seek cooperation with the private sector for improved implementation of sustainable construction. Chan, Darko, Olanipekun and Ameyaw, (2018) discussed financial areas of likely government intervention. Djokoto and Dadzie, (2014) discussed how government being a major client of the construction industry can influence the positive direction and implementation of sustainable construction. For the conceptual model, these two main functions of government being a client and a regulator of the industry were considered very important in the actualisation of an improved and sustainable construction practice in the industry. The functions of government and other stakeholders are now briefly explained.

6.3.1   Government as a Regulator of the Construction Industry

Government sets the bedrock of the construction industry by registering professional service providers, consultants and contractors for the industry. Government also sets the standards for the operations of the industry by instituting the building regulations, codes and ordinances. This major act of the government makes it a paramount player in the industry. Defaulters to the regulations are also punitively addressed by the government machinery (Young, 2013).

6.3.2   Government as a client of the industry

The government is the single biggest client of the industry. At the different levels of the government, federal, state and local governments and the corresponding ministries, directories and agencies (Oladinrin, Ogunsemi and Aje, 2012). The construction industry relies to a great deal on the satisfaction of the client as this guarantees future patronage (Omonori and lawal, 2014). To this end, government being the biggest client of the industry can influence decisions of the stakeholders in the industry towards sustainability. If a government is committed to delivering sustainablity in its programmes especially with regards to the construction industry, it is much feasible to have this shown in its conceptualisation documents, specification details, and client's briefs at all stages of the project. This reinforces the influencing power of the client in project delivery (Oladinrin *et al*. 2012)

6.3.3   Stakeholder's input towards improved sustainable construction practice

The construction industry is wide and involves varied entities such as clients, corporate organisations, consultants (Engineers, Architects, Quantity Surveyors, Builders), financiers, academia, contractors, suppliers etc. This wide resource base needs to be harmonised and processed to produce requisite knowledge for the advancement of the industry (Oribuyaku, 2015). To this end, construction boards, green building councils and other various bodies of knowledge have arisen in the construction industry

of more developed countries to further advance and culturally entrench improved processes, technologies and policies (Ofori, 2012).

6.3.4   Agenda implementation of the Policy on Sustainable Construction

 Sustainability as an agenda has been discussed as the focus of the major stakeholders in the construction industry. However, formulating and implementing the agenda of sustainable construction within and across the industry requires an in-depth understanding of the environment and the most appropriate approaches for optimum integration, legitimacy and acceptance of the policy (Chang *et al*., 2016; Ogunbiyi, 2014). Implementing sustainable construction policy will mean a deviation or improvement from the norm and as such, citizens must be made to be aware of the transition and their inputs and government must be the sure of the legitimacy of the policy (Rogge and Reichardt, 2016).

Error terms

Error terms are indicated on the model and represented as e1-e21 attached to each variable in figure 6.1. Error terms are residual variables produced by a mathematical or statistical model. Error terms are created when the model does not fully represent the actual relationship between the independent variables and the dependent variables. Due to this incomplete relationship, the error term is the estimated amount at which the equation may differ during empirical analysis.

The observed dependent variables are predicated on a second order variable labelled improved sustainable construction practice ISCP in figure 6.1. The conceptual model was tested and validated via a national questionnaire survey which is presented in chapter 10.

The observed dependent variables identified as the leading factors in the table 6.1 stem from the sources as identified earlier from the literature. The indicators are the identified points classified therein under the dependent variables.

Table 6.1: A synthesis of identified policy expectations for Improved sustainable construction practice from literature

Leading Factor	Indicator	Breakdown of Indicators	Source
Government as the Regulator	Executive administration	Creation of regulations and ensuring compliance and punitive measures to defaulters.	Son, *et al.*, 2011, Ojo, *et al.*, 2014, Elmualim and Alp, 2012
	Creation of a central construction body to spearhead strategies and implementation	A Board/ agency for registration and coordination of practitioners in the industry.	Ofori, 2012, Powmya and Abidin, 2014
	Developing a country owned framework for sustainable construction	Local initiatives that comply with the climates and needs of the country on sustainable construction.	Athapaththu and Karonasena 2017, Van Wyk, 2011
	In improving research/ technology within the industry	Local research on sustainable construction should be encouraged	Ofori (1994), Amiolemen and Adegbite, 2012
	Finance including Green bonds	Green bonds sourced are to be disbursed to the appropriate units within the industry	Ofori (1993), Chan, *et al.*, 2018
	National Strategy on sustainable construction patterns	The Nation should have an action plan towards sustainable construction	Coenen *et al*, 2012, Latham, 1994
	Training the trainers in academic and professional circles	Motivations and provision of incentives for the knowledge development within the industry.	Ogunde, *et al.*, 2016, Oribuyaku, 2015
	Revising the building code for sustainable construction	A modern building code that captures sustainability is urgently needed.	Oribuyaku 2015, Amasuomo *et al.*, 2017
	Revising old extant laws to meet the demands of sustainability	Existing environmental laws need to be broadened to meet up to the demands of the day.	Nwokoro and Onukwube, 2015 Ogunjobi, 2014, Oribuyaku, 2015
	Special considerations and bye laws for urban areas	Due to population and infrastructural need, urbane areas must have special byelaws that guard construction and occupancy.	Nwaokoro and Onukwube, 2015, Ogunjobi, 2014, Oribuyaku, 2015

Government as a Client	Exerting its influence as a client	Government can insist its own improved conditions of contract is used on its projects	Aniekwu, 2004, Latham, 1994
	Ensuring its own projects are done sustainably	Government being the client can make sure all its projects are executed using sustainable construction initiatives	Djokoto *et al*, 2015
	Demand for sustainable construction projects from brief to delivery	Being the client, Sustainable construction expectations can be requested of all project participants, professionals, vendors etc.	Bal *et al*, 2013, Alsanad, 2015, Ametepey *et al*., 2015
	Ensuring demonstration projects are done to influence other clients in the industry	Demonstration/ Model projects that promote sustainable construction can be easily erected for learning and promotion of knowledge	Chan, et al., 2018, Pomwya & Abidin, 2014
	Ensuring all its multi-faceted institutions and agencies (Federal to municipal levels) key in on its plan.	Government is a controlling mechanism and as such all units should comply.	NBC, 2006, Rogge & Riechardt, 2016
Industry Stakeholders Input	Developing and maintaining a robust Green Building council for adequate implementation	Sustainable construction is better pursued through a group of like minds and common goal.	Ude and Ude, 2014
	Creating a common base for industry synergy through a board	Industry practitioners need to work as a team for the general industry success	Ofori, 2012,
	Continuous Professional development programmes for industry practitioners	Practitioners need to be availed of new skills in practice as it involves sustainable construction practice.	Ogunde *et al*., 2017
	Ensuring the cultural imprints through the curriculum at schools	Bridging the gaps between the academia and Industry	Nwoke *et al*., 2017
	Adequate 'train the trainers' schemes and Technology incubation centres	Knowledge development and management among practitioners and upcoming practitioners.	Ogunde, *et al*., 2016, Oribuyaku, 2015

Improving Agenda Implementation Routes	Breaking barriers of communication to reach a wider local audience	Ensuring sustainable construction practice gets to the grassroots.	Kemp, *et al*., 2005; Mthetwa, 2012
	Bottom-up approach to sustainable construction implementation	Local sustainable construction knowledge fuelling further developments at higher levels of the society	NBC, 2006, Bhuyan *et al*., 2010
	Committees of professionals starting from the municipal/ LG levels	Professionals ensuring compliance from the municipalities or local lowest levels of governance	NBC, 2006; Tunde-Olayeni *et al*., 2018
	Introducing punitive measures to violations of the national building code	The building code is a regulatory and statutory document and as such, defaulters must be corrected accordingly	Ogunjobi, 2014, Oribuyaku, 2015
	Tying some pre-contract sustainable construction initiatives to the design plan approval stage	Monitoring construction phases through some government agencies involved in approvals at different stages	Matisoff, *et al*., 2016
	Transitioning as a policy mix to involve other relevant sectors of the economy	A structural economic change involving construction industry and other related	Rogge & Reichardt, 2016, Markard, *et al.,* 2012

6.4   Hypotheses to be tested

Four hypothesised relationships between the dependent and the observed variables are predicted from the conceptual model, they are outlined below;

Observed variable - An improved sustainable construction practice

H1: A positive relationship exists between government's role as the regulator and improved sustainable construction practice.

H2: A positive relationship exists between government's role as a client and improved sustainable construction practice.

H3: A positive relationship exists between the input of stakeholders and improved sustainable construction practice.

H4: A positive relationship exists between the strategies for sustainable agenda implementation and improved sustainable construction practice.

6.5   Summary

This chapter discussed the proposed conceptual improved sustainable construction practice model based on factors identified from the literature. The observed variable in the proposed model is the improved practice of sustainable construction. Hypothesised relationships are also predicted and identified. The next chapter discusses the research methodology and underpinnings of the study.

CHAPTER 7
RESEARCH METHODOLOGY

7.1   Introduction

This chapter presents the philosophical and methodological underpinings for this study. It relays the justifications for approaches adopted and explains the procedures undertaken for the collection of data to explore the objectives and hypotheses of this study. First, factors that are perceived to have a significant impact on the implementation of sustainable construction through a policy view were identified from the literature. This study was a mixed methods study. The qualitative study was embarked upon using focus groups and semi structured interviews to bring these factors into focus and refine the conceptual model. Quantitative data was collected from the industry practitioners in the Nigerian construction industry to validate the conceptual model using Structural Equation Modeling (SEM). The chapter opens with research definitions, purpose and philosophy. It then addresses the research methodology and various methods of data collection.

7.2   Research Definition, Purpose and Characteristics

Pandey and Pandey (2015:7) defines ''*research as a systematic investigation or activity to gain new knowledge and improvements of already existing facts.*'' It is an intellectual pursuit responsible for bringing to cognition new knowledge and correcting past or present mistakes, remove misconceptions, improve clarity and add new learning to the existing body of knowledge. Research aims to find out the truth which is not yet discovered. Objectives of performing scientific research can be outlined below as identified by Gupta and Singh (2009: 4) and Pandey and Pandey (2015: 9-10):

- To improve familiarity with a phenomenon or achieve new understandings and insights into it (Exploratory/ Formative research studies);
- To discover newer knowledge through a thorough and critical investigation (descriptive reseach studies);
- To determine the frequency of occurrence or the association with another phenomenon (diagnostic research studies);
- To make predictions through the testing of hypotheses for causal relationship between variables (hypothesis-testing research studies);
- To develop a new theory or to contribute to existing ones; and
- To achieve new insights into a phenomenon and its explanations.

7.3   Research Paradigms

Research philosophy suggests assumptions about different worldviews, perceptions and perspectives of the world or a field of study. These underpin and inform the choices of research inquiry, strategy and

procedure of executing the research. There are numerous research paradigms, the four key ones are indicated in Table 7.1. This research utilised the pragmatic research pardigm as the mixed method was used.

Table 7.1 Research Paradigms (Cresswell, 2017 :9)

Postpositivism	Constructivism
• Determination • Reductionism • Empirical observation and measurement • Theory verification	• Understanding • Multiple participant meanings • Social and historical construction • Theory generation
Advocacy/Participatory	**Pragmatism**
• Political • Empowerment Issue-oriented • Collaborative • Change-oriented	• Consequences of actions • Problem-centered • Pluralistic • Real-world practice oriented

7.3.1 Pragmatic Paradigm

Pragmatism as a research paradigm holds the belief that no two people have exactly identical experiences, so their worldviews cannot be identical. There are always varying degrees of shared experiences between any two people that lead to different degrees of shared beliefs (Kaushik and Walsh, 2019). The likelihood of acting in the same way in a similar situation and assigning similar meanings to the consequences of those actions depends on the extent of shared belief about that particular situation. Therefore, worldviews can be both individually unique and socially shared (Maroouf, 2019).

The pragmatic paradigm to research approaches the problem with a purpose of having practical and useful outcomes and solutions (Creamer, 2018). Pragmatism arises out of the need for actions, situations and consequences rather than an antecedent situation as in post positivism. It is focused on applications, what works and solutions to the perceived problem. Pragmatism prefers direct action to theorising or philosophising and endorses "*practical theory*''. The philosophical underpining for this paradigm is that for mixed methods researches, it focuses on the research problem on social science research and uses a pluralistic approach to derive knowledge out of the problem (Cresswell and Cresswell, 2018).

Pragmatism as a research paradigm has been to find a middle ground between philosophical dogmatisms and skepticism and find workable solutions to long-standing philosophical problems. Pragmatism rejects binary (either-or) choices suggested in traditional dualisms. Pragmatism replaces the historically popular epistemic distinction between subject and external object with the naturalistic and process

oriented organism-environment transaction. Pragmatism views knowledge as being both constructed and based on the reality of the world one experiences and lives in (Teddlie &Tashakkori, 2009). Pragmatism has often been identified in the mixed methods research literature as the appropriate paradigm for conducting mixed methods research (Brierley, 2017). Pragmatism as a philosophical paradigm bridges the gap between the scientific method and the structured orientation of older approaches, the naturalistic methods and freewheeling orientation of newer approaches (Cresswell and Clark, 2017).

Pragmatists believe that research on any given question at any point in time falls somewhere within the *inductive-deductive research cycle.* Again, pragmatists challenge this distinct spectral contrast between objectivity and subjectivity. Pragmatic researchers believe that epistemological issues exist on a continuum, rather than on two opposing poles. At some point during the research process, the researcher and the participants may require a highly interactive relationship to answer complex questions.

As a result, there are many forms of this paradigm. Philosophical bases for this research paradigm are hinged on:

- Pragmatist researchers agree that the context of the research can be social, historic, political etc. hence there may be a post modern twist, a theoretical lens may be needed to view the context clearer in this parlance (Kaushik and Walsh, 2019). For the pragmatic researcher, this approach opens door to multiple methods, worldviews, different assumptions and data collection methods. Researchers have a freedom of choice in terms of methods, techniques and procedures that best meet the needs and suits the research. Pragmatists do not believe in the notion of the world as a unit and in unity. It makes mixed methods researchers look to many approaches for collecting and analysing the information sought (Maroouf, 2019).

- Pragmatists believe that reality is not static as it changes at every turn of event. Similarly, the world is also not static from a pragmatic point of view. The world is in a constant state of becoming. The world is also changed through actions and action is the way to change existence. Actions have the role of an intermediary. Therefore, actions are pivotal in pragmatism (Goldkuhl 2012; Morgan 2014). Actions cannot be separated from the situations and contexts in which they occur (Morgan, 2014). Actions are linked to consequences in ways that are open to change (Maroouf, 2019). Actions depend on worldviews that are a socially shared sets of beliefs (Morgan, 2014).Pragmatism is not committed to any one root of philosophy and reality. It applies to mixed methods research as it enables researchers to draw both from quantitative and qualitative assumptions in the course of the study (Cresswell and Cresswell, 2017). The concept of truth is what works at the time. The pragmatic researcher looks to what and how to approach the study based on the intended consequences of the research and what they intend to

do with the information. Mixed methods researchers however need to establish a purpose for mixing up the data and information gotten from both sources (Cresswell and Cresswell, 2018: 297).

Table 7.2 The pragmatic paradigm (Creamer, 2018: 97)

Paradigm Dimension	Influence on Research Process
Ontology	Avoid theories about the nature of truth and reality and place the emphasis on what works; truth and knowledge are always uncertain, tentative, and changeable over time; challenge many traditional dualisms (e.g., objectivity–subjectivity); knowledge is context specific; emotions and opinions are every bit as real as the physical world
Epistemology	Quality is judged by usefulness, utility, or transferability.
Methodology	Relies on abductive reasoning that moves back and forth between both deductive and inductive analytical approaches (Morgan, 2007), methods are selected by what is appropriate for the setting
Axiology	Concern for linking research to practice, action focused

7.3.2 Justification for the paradigm utilised for this study

Identifying the problems of non existent and sometimes low implementation of policies in the construction industries of developing countries (Alsanad, 2015; Durdyev *et al*., 2018; Davies and Davies, 2017), this study has taken the pragmatic paradigm to assess the construction industries of developing countries through literature by looking at what has worked in some developed countries (Singapore, Denmark, Germany and United Kingdom) some other developing countries in sub Saharan Africa and understudied the Nigerian construction industry especially in the area of sustainable construction policy formulation, implementation and practice. The pragmatic approach was decided as best suited as the study is aimed at expected action through the formulation of new policies or improvement of existing/ extant policies towards improving the current reality of low sustainable construction practice.

7.4 Research Methods

Researchers adopt different techniques of data collation. Quantitative method (data collection through numbers), qualitative methods (data collection through words) or through a mix of words and figures known as mixed methods in order to collect data (Dawson, 2019).

7.4.1 Qualitative methods

The qualitative researcher seeks to record qualities rather than quantity (Walliman, 2011). Qualitative studies go deep and seek expressions from the view of the respondent's intuition and experience. Often involving understanding a complex phenomena and seeking to know why things happen as they do, to determine the meanings often attributed to certain phenomena (Fellows and Liu, 2015). Another integral determinant of the extent of the output of the qualitative study is the extent of the researcher's integrative and analytic skills and the knowledge of the environment/social context where the data is being collected (Bhattacherjee, 2012). Qualitative methods rely on non-numeric data (interviews and observations) however, the results from this study cannot be easily generalisable (Pandey and Pandey, 2015).

7.4.2 Quantative methods

Quantitative methods rely on the science of numbers and statistics and hence is sometimes known as the scientific method. (Cresswell and Cresswell, 2018:16) relates that the quantitative methodology of research is generally associated with the positivist and post positivist paradigm. The quantitative method usually involves collecting and converting data into numerical form to enable statitsical calculations to be made and conclusions to be drawn. Quantitative data relates with the testing of hypotheses and seeks to gather factual data and relationships between facts. The quantitative method gives precision and the ability to give sophisticated analyses and can be easily replicated else where. This makes it have a high reliability (Cresswell and Cresswell, 2018:16). The mechanistic nature of the quantitative method also excludes notions of freedom, choice and moral responsibility.

7.4.3 Mixed methods research

Mixed methods strategy of executing research is one where the researcher combines both qualitative and quantitative research methods, tools and concepts into a study for the purpose of improved depth of understanding. It is rooted in the pragmatic paradigm and tends to be more popular due to the inadequacies perceived in the quantitative and qualitative methods. Mixed methods provide a leverage as it is a way of compensating for the strengths of one single method (quantitative or qualitative) (Cresswell and Cresswell, 2018).

Mixed research method was utilised in this study to draw complementary strengths from both qualitative and quantitative approaches (Maarouf, 2019). The use of both qualitative and quantitative approaches in combination provides a better understanding of the research problems better than either one alone (Cresswell, 2017). Another reason for selecting a mixed methods research for this study was to be able to perform a triangulation of all research approaches undertaken. The purpose of the triangulation exercise was to enrich and strengthen research results by using different methods of data collection and analysis to study the same phenomenon in order to gain a near complete understanding of this phenomenon (Kaushik and Walsh 2019). Triangulation is often also used to compare outcomes from a

particular method with findings reached by another method (Maarouf, 2019). The shortcomings of this method which include cost, time and the rigors of analysing three streams of data were overcame through the use of technology. The lead study researcher also involved assistants in the data collection and initial processing to save some time.

7.5   Data Collection method and procedures

The data collected for this study was done in three phases with phase one involving an extensive literature review comparing sustainable construction practices and policies in selected developed and developing countries. The fundamental processes involved in the preparation of a pubic policy were also discussed. This helped in the creation of a conceptual model to understand the key policy drivers and barriers towards the provision of a more implementable uptake of sustainable construction in the Nigerian construction industry. Phase two involved the developing of research instruments and collection of data through the focus groups, semi structured interviews, and the industry questionnaire survey. It also involved the application for ethical permissions to conduct the study in line with research practice. Phase three included the reporting of the data received from the field surveys, the validation of the conceptual model through the analysis of the factors and evaluation of both the measurement models and the structural model and the identification of other research findings. The data collection methods used in this study were the review of literature, focus groups, semi structured interview sessions with experienced personnel and the industry questionnaire survey with experienced professionals in the Nigerian constructioin industry as shown in figure 7.1 below.
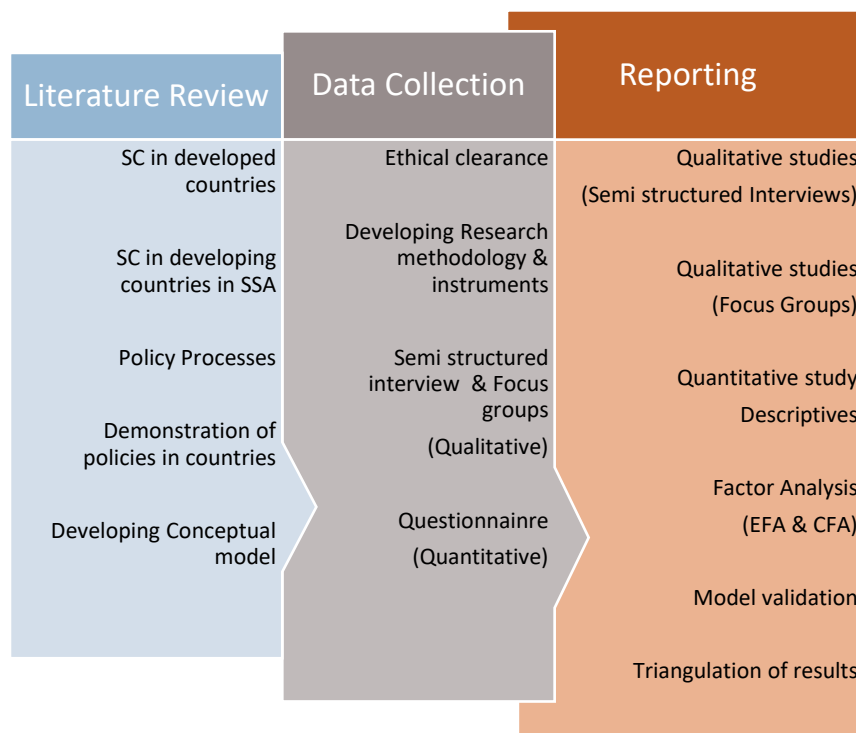
Figure 7.1: Data collection methods employed in this study

7.5.1 Literature Review

Kumar (2019) explains that a literature review is an integral part of the research process as it makes contributions to all the operational steps to be taken in the study. The literature review brings focus and clarity to the earlier identified research problems, broadens the knowledge of the researcher on the topic, improves the methodology and contextualises the findings of the study (Walliman, 2011).

The literature review was used in this study to:

- Understand the extent of sustainable construction practice in developed countries and the policies guiding the successes;
- Establish the level of practice of sustainable construction in sub Saharan Africa and Nigerian construction industry in particular, with a view to drawing inferences;
- Examine the public policy development and implementation cycles democratic governments use in the implementation of industry/public policies; and
- Review improved sustainable building regulations of countries (developed and developing) and implementation strategies to identify gaps in the Nigerian construction industry.

A review and analysis of journals, textbooks, professional bulletins, conference proceedings and internet websites were synchronised to achieve the objectives of the research.

7.5.2 Semi Structured Interviews

Interviews provide an interactive environment with words and discussions as the medium of exchange. It provides a two-way interaction between the interviewer and the interviewee. The interaction of both parties lead to the production of insights that may generate knowledge. Interviews can be structured, semi-structured or unstructured (Creamer, 2018). While structured interviews are more frequently standardised interview sessions with planned formal attributes, an unstructured interview has the attributes of an informal discussion. It does not reduce the power of eliciting responses from the respondents and sometimes, the informal setting give the respondents leverage to talk and reveal more insights to the interview subject matter (Bernard and Bernard, 2013). A semi structured interview exists between the spectrum of structured and unstructured interviews. Semi structured interviews allow for open ended responses from respondents and thereby gives room for more indepth information (Teddlie and Tashakori, 2009). It also provides an opportunity for interviewers to learn answers to questions and the reasons that prompt the answers. A semi structured interview also allows respondents to open up about sensitive issues. Qualitative data generated may also be easily compared to future and previous data. A major challenge linked with interviews are that they are time consuming because they may have

a minimum number of interviews to do to be able to draw inferences and conclusions from (Cresswell, 2017).

It was necessary to meet with seasoned professionals in the Nigerian construction industry and draw deeper inferences from them on why there was minimal practice of sustainable construction and other related issues in the construction industry. Professionals who have above fifteen years of astute practice and are in managerial positions in different cities were contacted, it was not feasible planning a joint interview with them together in the same location, hence the burden of locating them in their individual offices and having a semi structured interview was the more likely option.

Construction professionals both in government service and private practice in the cities of Abuja and Lagos were selected. The selection criteria for these two cities were based on the fact that they are both the administrative and commercial capitals of the country and are the two most planned and developed urban cities in the country. The two cities also house the highest number of professionals in the Nigerian construction industry because of urbanisation.

Years of experience was seen as valued criteria as it relates to the topic because the study is targeted at policy makers and highly experienced personnel. The opinion of decision-makers within the industry vis a vis that of the average practitioner is to be assessed. To this end, a purposive list of fifteen participants was drawn up both in Abuja and Lagos. Invitations to participate and follow up calls were sent through e-mail and phone calls. Only eleven participants agreed to participate, and eleven interviews were conducted. The number was considered as enough as (Tracy 2012: Sim, Saunders, Waterfield and Kingstone, 2018) recommend between 10 and 15 respondents as adequate for an interview to prevent saturation. An interview schedule was developed to ensure the uniformity of questions asked the interviewees (Dawson, 2019). Audio recordings of the interview sessions were made to aid in the content and thematic analysis of the interviews thereafter. The interviews lasted on average forty five minutes for each participant and the outcomes were coded and analysed using Nvivo 12. The report and outputs are discussed in chapter 8 and a copy is attached in Appendix B.

7.5.3   Focus Group Interviews

Focus groups are a type of qualitative research used commonly in product marketing research to evaluate the opinion of strategic stakeholders to the product being understudied. It has gained prominence in sociology as well as in the built environment (Kumar, 2019:124; Van Eck and Burger, 2016). A group of between six and twelve people having diverse views on a subject matter is brought in to a guided discussion are engaged to provide differing insights, perceptions, beliefs, or opinions (Cresswell and Cresswell, 2018; Dawson, 2019). As a socially oriented research, focus groups capture real life data in a social setting, it is also often flexible with high face validity (Van Eck and Burger, 2016). It also generates quick results and costs less to conduct. Group discussions produce a group

effect where interactions and insights are viewed with different perspectives and most times consensus is reached. The major disadvantages associated with focus groups are the issues of less control when compared to individual interviews and the difficulty of getting the desired group of people to be put together in the same place (Kumar, 2019).

Focus group research involves bringing a small group of people at a location and have them discuss a phenomenon of interest for a period of one to two hours (Nyumba, Wilson, Derrick, and Mukherjee, 2018). Discussions are moderated and led by a trained facilitator. Attempts are made to build a holistic understanding of the problem based on the comments and experiences of the respondents. Focus groups are a form of strategy in qualitative research where attitudes, opinions and perceptions towards an issue are explored through a free open discussion between experienced members of the affected group and the researcher (Then, Rankin and Ali, 2014).

A list of questions was drafted and used when the focus groups were conducted. Different professionals within the industry working with different agencies such as client organisations, contracting organisations and supervisory organisations for building control implementation were represented in the focus group.

Focus groups were considered suitable for this study to create life experiences from a multi professional diverse or consensus point of view within the construction industry. Two focus group surveys were conducted for this study within Lagos cosmopolis. The first focus group discussion took place at Lagos State Building Control Agency (LASBCA) office at Ilupeju, Lagos. LASBCA is an agency created by the Lagos State government to improve building processes and maintain standards from pre-construction approvals to obsolesence stage, and monitor urban area control in Lagos state. Participants comprised construction professionals (architects, builders, civil engineers, quantity surveyor and urban planners) working for this agency from different departments (design approvals, safety unit and construction enforcement units) and one consultant professional in private practice. The discussion took place in one of the open offices after the close of work and had eight professionals in attendance. The second focus group comprised professionals mainly working on a construction site in Ikeja, Lagos (builders, civil engineer, services engineer (mechanical) and quantity surveyors and two consulting professionals from outside the site (an architect and a quantity surveyor) working in private practice. The second focus group discussion comprised seven professionals. The focus group discussion took place in the board room of the site office. They were all seasoned professionals with over five years cognate experience in practice. The responses were coded and analysed using Nvivo 12, the outputs are discussed in chapter 9 and a copy of the guide is attached in Appendix C.

7.5.4   Questionnaire Development

A questionnaire is a pre-designed form containing questions and opinions from the researcher to gain more insights and statistical information (data) from selected respondents. Questionnaires are the most common data collection methods in quantitative studies (Radhakrishna, 2007). Owing to the fact that questionnaires assist to gather information on attitudes, opinions, behaviours and other information, it should be designed to be valid and realiable to reduce measurement errors (Pagano & Pagano, 2012).

Advantages of using questionnaires include the fact that they are cheap to administer through post, internet or email. It also saves time as it can have a wider outreach within a short while. The questions are fixed and do not change once printed and sent to the respondents (Creamer, 2018). Questionnaires are answered anonymously. This allows for sensitive questions to be asked because the anonymity of respondents also aids the honesty of respondents (Pagano & Pagano, 2012).

A major disadvantage of questionnare usage is low return and response rate. Also, respondents are given time to fill it and resend to the researcher mostly through the same route. This means that the researcher may not be able to ask questions on the received document (Dawson, 2019).

A questionnaire was developed to investigate the quantitative aspects of this study drawing from the insights arrived on in the conceptual framework chapter. The questionnaire consisted of five parts, with the first part covering the demographic of the details of the respondents. The four other parts were based on each of the four identified drivers of an improved sustainable construction practice in the Nigerian construction industry. The statements made therein were scaled accordingly.

The commonest scale for obtaining respondents feedback in a questionnaire is the likert scale (Fellows and Liu, 2015). In a five point likert scale which is used in this study, the respondent is presented with statements focussing on the subject matter and is expected to indicate their response on the five options available. Point one to point five of the scale was graduated as follows: 1 indicating ''strongly disagree,'' 2 indicating ''Disagree'' up to 5 which indicated ''strongly agree.'' The aim of the likert scale was to measure and rate the opinions of the respondent using the options presented.

Fifty (50) factors on areas of expected policy improvement for sustainable construction were originally identified from literature and guided by the conceptual framework. The factors were grouped based on the four relevant area (government as a regulator, government as a client, stakeholders/ industry response and implementation strategies) that can deliver or better ensure the success. After having the interviews, it became evident that the questionnaire had to be refined to reflect some of the outcomes of the qualitative study. The study then focused more on the formation of policies than the enforcement of such policies. The removed questions for example question B6 asks ''*which arm of government is expected to be most active in the implementation of sustainable construction*'' and question B7 which

asks about the need strict policy regulations and enforcement as regards sustainable construction practice. These questions were later removed and the numbers rearranged due to the insights received during the interviews and focus group discussions. It was evident that there is a need to concentrate more on the factors that centered on the formulation of new policies rather than the enforcement of the moribund existing scenario and that enforcement of the current situation will not really be sustainable. Question D4 asks about the synergy of professionals in relation to their input in the implementation of the existing building code. Question E5 also was removed as it focused more on policy implementation at the municipal level and the capacity to execute sustainable construction. These were removed as both were discussed at length in the interviews and discussions. The final study instrument had 46 variables still in the four factors earlier identified.

In developing questionnaires for statistical surveys, open ended questions and close ended questions can be used to elicit responses from respondents. Open questions allow the freedom of expression of opinions on the questions asked (Cresswell, 2017). Close ended questions on the other hand provides options from which a single response is selected. Respondents find this type of questions quicker and easier to answer. Close ended questions are easily coded for analysis. The details of the analysis for the quantitative aspects of this study are presented in chapter 10 and a copy is attached in Appendix D.

7.5.4.1 Sampling

Sampling is a selection technique for picking a representative unit from a whole population for the purpose of analysis. Representativeness of the population is important to achieve valid and reliable inferences, findings and conclusions (Fellows and Liu, 2015). Sampling can be probabilistic or non-probabilistic. Probabilistic sampling entails that all the elements in a specified sample have an equal chance of being picked and examples include simple random sampling, stratified sampling, cluster sampling, multi-stage sampling and systematic random sampling (Cresswell and Poth, 2016). Non-probabilistic sampling methods on the other hand are based on the subjective judgement of the researcher and examples include quota sampling, convenience sampling, purposive sampling, self selection sampling and snowball sampling.

Selecting the sample for this study was daunting and a great deal of care was exercised when choosing the type of sample design. Representativeness of the population was ensured by the researcher for the quantitative and qualitative studies.

The respondents for the semi structured interviews and the focus group discussions were selected through purposive sampling as adequate insights were required of the respondents by a virtue of the experience they have garnered over the years. They have participated in sustainable construction projects and have above average knowledge on sustainable construction. The other focus group

consisted of professional members from a state building control monitoring agency who were also seasoned in the implementation of policies and practices related to sustainable construction. The personal interviews done were limited to eleven respondents with seasoned and varied backgrounds in the Nigerian construction industry.

In selecting respondents for the questionnaire survey, the simple random sampling method was employed in selecting respondents for the survey. Hand distribution and internet enabled distribution services were used to ensure higher reach and randomness of the distribution. Email addreses and relevant internet based phone applications were secured and utilised randomly in the study.

7.5.4.2 Sampling Frame

For the questionnaire survey, professional bodies of respondents (architects, quantity surveyors, builders and civil engineers) were approached for a list of actively registered practitioners. Emails were sent and one on one distribution of the research instrument was done in some companies and establishments accessible to the researcher. The criteria for participation in this study was five years professional practice experience in construction and adequate knowledge of sustainable construction either having participated on sustainable construction projects. The locations of Lagos and the Federal Capital Territory FCT(Abuja) were selected as they are the capital cities of the country (past and present) respectively and they are locations where the knowledge and practice of sustainable construction is rife. The numbers obtained are not the total number of practitioners in that location but of the registered practitioners with valid practice licenses as at the time of this study. Details of the sampling frame are represented in table 7.3 below.

Table 7.3. Sampling frame

S/N	Registered Professionals	Lagos	FCT	Total
1	Architects	345	265	610
2	Builders	220	175	395
3	Civil Engineers	342	202	544
4	Quantity Surveyors	303	290	593
	Total	1210	932	2142

Using the Yamane sample calculation where:

$$n = \frac{N}{1 + N \times (e)^2}$$

N = the population size

n = the population size

e = the acceptable sampling error,

a sample of 337 was calculated as adequate for a population of 2142 respondents. Three hundred and eighty (380) questionnaires were sent out and two hundred and forty nine questionnaires were received and found useful for further research purposes.

7.5.4.3 Pilot study

Pilot studies pre-test with a view to refine questions and responses expected in a field study before the main study is done (Cresswell and Poth, 2016). The importance of pilot studies are outlined in Bell, Bryman and Harley (2018) and Fellow & Liu (2015). A pilot study was conducted to ensure the instructions were clear and understandable to the proposed respondents, highlight ambiguity and tautlogy, and to reexamine the intelligibility of the questions raised. The pilot study was conducted in November 2019. Ten questionnaires were sent out to selected respondents via email and six were returned within the required time frame. Comments and suggestions provided by the respondents were addressed in the development of the final industry survey. Modifications made to the final industry survey based on findings of the pilot study are presented below:

- Utilising industry communication techniques in the development of the final survey, rigorous checking and proof reading was done to ensure that all related more to the industry.
- It was suggested by one of the respondents that the questions be actively worded as against the passive tone it existed in to facilitate easy assimilation and quicker replies by future respondents.

According to the pilot study the duration to complete one questionnaire ranged from 10 to 20 minutes. A median value was adopted, and the final survey was estimated to be completed in 15 minutes on average.

7.5.4.4 Cleaning and coding of data

 Audio recorded data and other sources of raw data generated from the field interviews were transcribed and prepared for use. Organisation and categorisation was done using Nvivo 12. The data was coded, organised and sorted into themes and categories and structures capable for interpretation accordingly using visualisation themes provided by the software. The outputs generated and subsequent discussions are discussed in later chapters.

Data obtained from the questionnaires were coded into corresponding numbers and analysed statistically. Thereafter, the data was cleaned in order to check the accuracy of responses, missing data, accuracy of the coding and correct any observed errors. After this was done then, the statistical analysis proceeded.

7.5.4.5 Data Analysis

Data anaysis consists a series of processes to convert collected data into useable information. The detailed data collected and the processes undertaken to ensure reliable information was obtained are discussed in subsequent chapters. Descriptive analysis of the respondents was assessed, assesment of normality of the data collected was done with SPSS version 27. Exploratory factor analysis was done using SPSS version 27, while confirmatory factor analysis was done using SPSS AMOS version 27. The model was also validated and hypotheses tested through the structual equation modeling using SPSS AMOS version 27.

7.6   Reliability and Validity

Reliability and validity of obtained information from the field is the main aim of all data collection methodologies (Hennink, Hutter and Baeley, 2020; Lindlof and Taylor, 2017). As such, research emphasis often focuses on it.

7.6.1   Reliability

Reliability refers to the extent of the consistency assigned to the same category by different observers or by the same observer at different occassions (Hennink, *et al*., 2020). Reliability is measured based on the procedure taken and the documentation or guidelines that have been used over a period of time and as such reliable to the extent of its consistency (Golfshani, 2003). A reliable method of collecting evidence is one which if anyone else or the same person at a later time uses would come up with relatively same results. The research if repeated, the same resuls should be arrived at (Nelson and Syed, 2015).

7.6.1.1 Reliability for the Qualitative Study

In qualitative studies, ensuring reliability lies in credibility and consistency of the information arrived at over time. Ensuring reliability or rigour and transferability in qualitative studies involves a bit of establishing validity as well, however, a reliable measurement may not always be valid, but a valid measurement should always be reliable (reproducible/ consistent) (Nelson and Syed, 2015). An interview schedule was drawn up to ensure consistency of questions respondents were asked, cross validation of methods used and triangulation of the report findings was done.

7.6.1.2 Reliability for the Quantitative Study

In quantitative studies, there exists different types of reliability which include internal reliability and consistency, test-retest reliability, split half reliability, parralel forms of reliability and inter-rater reliability (Noble and Smith, 2015). Internal reliability refers to the measurement consistency within a

measuring instrument. Inter-rater reliability which looks at the consistency between measured subjects, test-retest reliability which measures the consistency of repeated adminstration of the measurement instrument to the same scenario, parallel forms of reliability wherein the consistency of different but related measurement tools are applied on the same sample (Leavy, 2017). Reliability and internal consistency was assessed in this study by using the Cronbach's Alpha. This was more feasible in the light of this study and correlations were also assessed. Reliability was ensured in the coding of these questions, cronach's alpha and correlational tests were also used to measure reliability in this study.

7.6.2   Validity

Validity is described as the degree of legitimacy, acceptance and accountability obtained in data collection. Validity stands for the truth obtainable in the data collection process and can also be defined as the degree to which a measure accurately captures what it is intended to measure (Golafshani, 2003). Validity is primarily concerned with checking if the research design addresses the research questions and if the objectives of the study are fully realised. It also relates to the correctness and credibility of a description, conclusion and interpretation. Threats to validity include instrumentation, inappropriate testing and history (Golafshani, 2003; Noble and Smith, 2015).

Validity is subdivided mainly into two main areas namely internal and external validity. Internal validity relates to the details within the data while external validity is more concerned about the generalisability of the results emanating from the data. Sampling and representativeness are very important in this regard (Leung, 2015). Other types of validity are explained in table 7.4 below.

Table 7.4: Types of Validity (Leavy, 2017: 99)

Type of validity	Description
Face validity	A judgement call made by regular people that, at face value, the measure is tapping what we think it is
Content validity	A judgement call made by experts that the measure is tapping what we think it is
Construct validity	The measure is tapping ino the concept and related concepts, as we propose, which requires us to create highly specific operational definitions
Statistical validity	He statistical analysis chosen is appropriate and the conclusions drawn are consistent with the statistical analysis and the rules of statistical law
Ecological validity	The findings are generalisable to a real world setting
Internal validity	Precautions have been taken to saafeguard against the possibility than an extraneous variable influenced the results
External validity	The findings have only been generalised to populations supported by the tests

7.6.2.1 Validity for the Quantitative Study

Face validity was ensured by a robust examination of the literature, sample adequacy, sample representativeness, the use of correct relevant data processing tools, correct data analysis, interpretation and justifiable conclusions. Confidentiality and conformity to ethical standards also ensured the face validity of this study.

Content validity was achieved through the literature review to identify relevant factors necessary to improving the sustainable construction practice in developing countries. Piloting the studies also helped to improve the content validity as it was refined after the piloting exercise (Noble and Smith, 2015).

Convergent and discriminant validity was tested through correlation of items on the same scale and on other scales and the convergence or loading on a single construct in the measurement model. Correlation coefficients, factor loadings, exploratory factor analysis and confirmatory factor analysis was used to test for convergent and discriminant validity.

7.6.2.2 Validity for the Qualitative Study

Validity from the perspective of the qualitative study refers to the rigors, thoroughness, quality and trustworthiness/ credibility of the study process and outputs (Golafshani, 2003). Validity is related to reliability in qualitative studies as it is believed that there can be no validity without reliability (Leavy, 2017; Noble and Smith, 2015). Measures of ensuring validity include engaging different methods of primary data gathering, recording the outputs for easy checking, sorting, rechecking and the introduction of triangulation processes. Triangulation is typically one good strategy (test) for improving the validity and reliability of research or evaluation of findings (Lindlof and Taylor, 2017). This study underwent the different identified processes of utilising different methods of data gathering, ethical audio recording, checking and rechecking before coding and triangulation of report outputs.

7.7 Ethics

Ethics is the branch of philosophy concerned with the morality and perception of right and wrong (Bryman, 2016). The law, morality and etiquettes of the way a group of people or individuals conduct the activities of the group. Ethical research is defined as the application of moral rules and professionalism to the collection, analysis, reporting, and publication of information about research subjects (Lindlof and Taylor, 2017).

Ethically sensitive issues were taken into consideration during this data collection exercise. Efforts were made to ensure that the questions asked did not bother on personal or sensitive issues and where answers drew on personal experiences, the inputs are confidential. The inclusion of informed consent and confidentiality of supplied information was adequately communicated to all respondents. Privacy and confidential information was also communicated to be taken in confidence and not included in the outcomes of the study. Permissions to have oral discussions audio-recorded was expressly sought as indicated on the interview schedules for the self structured interviews and the focus groups.

A covering letter from the research office of the University (Humanities and Social Sciences Research Ethics Committee) was attached to the questionnaires and participants were requested to read, understand and fill the informed consent letter prior to filling the questionnaires. Consent could also be withdrawn anytime during the course of the survey. All of this was communicated clearly to the respondents. Ethical clearance with full approval was obtained through the University of KwaZulu-Natal research office with identification number HSSREC/00000537/2019. A copy of the ethical clearance document is attached in Appendix A.

7.8   Chapter Summary

This chapter introduced the research methodology designed to achieve the aim and objectives of this study and the way it has was carried out. The selected research paradigm and the research process for the study were explained. This study was carried out in three phases and reported. Validity, reliability and relevant ethical considerations were also carefully discussed. Chapters 8, 9 and 10 will explain the outcomes of the field work in detail.

CHAPTER 8

RESULTS FROM THE SEMI-STRUCTURED INTERVIEW SURVEY

8.1   Introduction

This chapter describes in detail the results from the interviews conducted in Abuja and Lagos in Nigeria. The respondents were purposively selected in these cities. The idea of this chapter is to assess the level of sustainable construction practice and determine policy barriers and drivers in line with objectives two, three and four of this study. The interviews were conducted to structurally understand the current level, challenges and awareness of sustainable construction practice in the industry, to examine existing policies and policy documents with the rate of use and the level of transformation and to check the impacts of policy drivers identified from literature in the field. The expected roles of government and stakeholders in the policy and practice of sustainable construction are also highlighted.

8.2   Methodology

This was an interpretivist study in which semi-structured interviews were conducted with professionals in the construction industry. The target sample for this study were architects, quantity surveyors, builders, civil engineers and urban planners. The research sample involved professionals who have diverse experience in terms of representation in order to ensure the diversity of respondents. This was necessary to achieve adequate representativeness of the construction industry as each of the professionals could contribute differing viewpoints based on their experience and insights. The data was processed as itemised in Table 8.1 and analysed using Nvivo 12.

Table 8.1: Stages of Analysing Qualitative Data used in this study

Stage	Description
Preparation	The production of transcripts from audio recordings and other primary sources of data collection.
Coding	Organisation of received data into content and themes as it revolves around the research questions
Categorisation	Grouping of likely and common themes to form broad patterns and thought illustrations
Structuring	Themes and sub-themes are highlighted and supported by thoughts, opinions and quotes from the transcripts
Interpretation	Research findings are interpreted based mainly on the researcher's understanding of the findings

Very few studies have been done on the use of qualitative studies in sustainable construction research in Nigeria. This study was done to identify underlying issues that may not be captured through the use of structured questionnaires and to benefit from the robust experience of the respondents who have worked in various sections of the industry in order to get deeper insights into the reasons why there is a perceived low participation in sustainable construction in the Nigerian construction industry.

For validity and avoidance of data saturation for the study, professionals were selected based on their years of practice and depth of experience on sustainable construction. Years of experience was seen as a valued criteria as it relates to the topic because the study is targeted at policy makers and highly experienced personnel. The opinion of decision makers within the industry vis a vis that of the average practitioner is to be assessed. To this end, a purposive list of fifteen participants was drawn up both in Abuja and Lagos. Invitations to participate and follow up calls were sent through e-mail and phone calls, however only eleven particpants agreed to participate and eleven interviews were conducted. The results were considered as enough as Tracy (2012) recommends between 10 and twelve samples adequate for an interview.

Construction professionals both in government service and private practice in the cities of Abuja and Lagos were selected. The selection criteria for these two cities were based on the fact that they are both the administrative and commercial capitals of the country and are the two most planned and developed urban cities in the country. The two cities also house the highest number of professionals in the Nigerian construction industry because of urbanisation. The profiles of the interviewees are represented on Table 8.2 .

Table 8.2. The demographic details of the participants.

Interviewee	Profession	Age	Gender	Qualification	Years of Experience	Place of work
Participant 1	Architect	>50	Male	Masters, PMP, FNIA	30	Federal Govt. Agency, Abuja
Participant 2	Architect	>50	Male	Masters, MBA, FNIA	25	Private Practice, Abuja
Participant 3	Civil Engineer	45 -50	Male	Msc, MNSE	30	Govt. Agency
Participant 4	Builder	45- 50	Male	Msc, FNIOB	30	Building control Agency, Abuja
Participant 5	Quantity Surveyor	40-45	Male	Msc, FNIQS	20	Govt Agency, Abuja
Participant 6	Quantity Surveyor	40-45	Male	Msc, MNIQS	15	Private Practice, Abuja
Participant 7	Builder	35-40	Male	Msc, MNIOB	13	Private Practice, Lagos
Participant 8	Civil Engineer	45-50	Male	BSc, MNSE,	20	Private Practice, Lagos
Participant 9	Urban Planner	35-40	Female	Bsc, MNITP	15	Local Govt. Municipal office in Lagos
Participant 10	Quantity Surveyor & Lecturer	50-55	Male	PhD, MNIQS	21	Private Practice
Participant 11	Quantity Surveyor	45-50	Female	Msc, MNIQS, PMP	24	Project Mgt Firm

The demographics of the interviewees are indicated in Table 8.2, with FNIA meaning a 'Fellow' of the Nigerian Institute of Architects. The fellowship is the highest form of membership of a professional body in Nigeria and it is used across all such professional institutions. The other professional organisations are represented, MNIOB means Member, Nigerian institute of building, Nigerian Institute of Quantity Surveyors for the quantity surveyors. The member, Nigerian Society of Engineers, and the Urban (town) planner is represented by the MNSE and the MNITP respectively.

The interviews were conducted during work hours and it took on an average of forty five minutes each with each respondent. The responses received were real and honest contributions from their individual experiences and training acquired in the course of their duties both within and outside the country. A good number of the respondents are well travelled and quite educated about how the principles and policy of sustainable construction work in other climes. Participants were allowed to share opinions and ideas about the questions raised, life related instances were cited and in some cases, these further stimulated the depth of the responses and provided insights and understanding of the topic at hand.

8.3 Discussion of Findings

Results obtained were coded using Nvivo 12 from QSR limited. The coding strategy used is in line with the standards of the software. Responses were transcribed and coded under likely themes and content analysis done to evaluate the responses. Themes based on the perception on sustainable construction practice and policy emerged namely: the perception of professionals on sustainable construction practice in their location and in the country generally, the major challenges observed to the full uptake of sustainable construction in the industry, preceived benefits of sustinable construction, the interviewee's perceptioin on the usage of the Nigerian building code, their ideas on improving sustainable construction practice through a policy, the need for strict policies and implementation mechanisms, stakeholder's inputs to improve sustainable construction practice and the possiblity and capacity of the local government in the implementation and enforcement of sustainable construction policy. Other themes discussed include the identified drivers for sustainable construction practice from the literature review and the expected roles of the government in the Nigerian construction industry. All of these themes are discussed in detail below.

8.3.1 Perception of Sustainable Construction Practice in the location and in the country

Respondents agreed as indicated in Table 8.3, that the practice of sustainable construction is low in the locations (Abuja and Lagos) and practically non existent in other parts of the country. This was occassioned by the fact that there are no poilcies and the political will to effect the existing environmental laws is lacking. In the cities where there is some evidence of sustainable construction, it is due to the population and urbanisation rate of the areas. However, as reported by participants 1, 2,

and 4, it is implied that there is a tendency for growth (evolution) in the area of sustainable construction practice in the location. The general notion that the level of practice is generally low in Nigeria is in line with the literature wherein the level of sustainable construction practice was identified by Ogunbiyi (2014) and Onuoha, *et al*., (2017) as being low.

Table 8.3: Qualitative Analysis Matrix on theme 1

Issue	Evidence		
	Interviewee's	responses	
Perception on sustainable construction practice	''The practice is at an evolutionary stage. The knowledge base necessary for implementation is increasing'' – Participant 1	''More needs to be done about sustainable construction on the level of policies and adequate implementation.'' – Participant 2	''Being a new concept, the level of practice is very low, In Lagos for example, you can count the number of houses built with sustainable materials.'' --Participant 10
	''Practice Level is very low, awareness is also low.''—Participant 5	''Averagely practiced in this location as this is a capital city but low in other parts of the country.''—Participant 4	''The level of sustainable construction practice in the Nigerian construction industry generally is very low even in this Lagos that host most construction activities in the country.''—Participant 8

8.3.2 Major Challenges to the full uptake of Sustainable Construction

Major challenges identified to the full implementation of sustainable construction in the Nigerian construction industry resulted in four sub-themes as indicated in Figure 7.1, namely lack of adequate awareness and trainings, policy and educational issues, the absence/lack of the building code and lastly, the lack of the political will on sustainable construction.
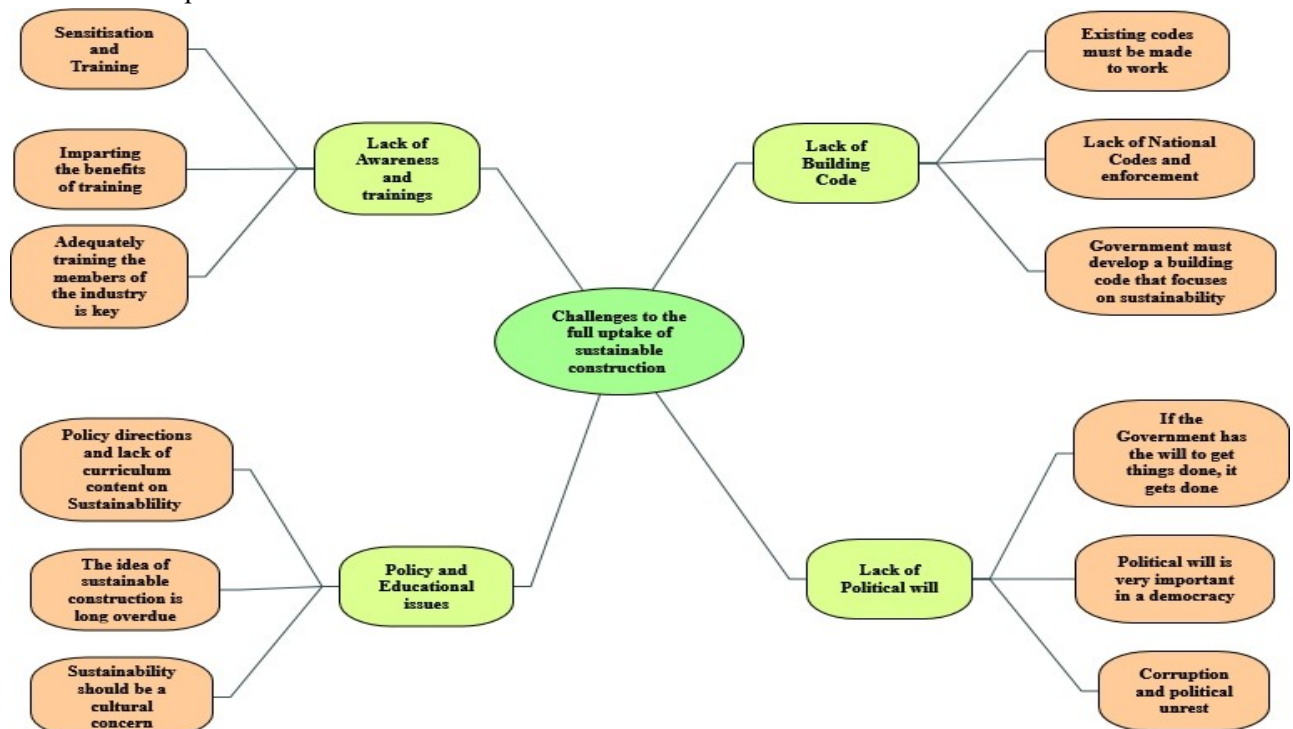
Figure 8.1. Mind map highlighting challenges to the uptake of sustainable construction (Theme 2)

8.3.2.1 Lack of adequate awareness and adequate training was identified by Bungwon *et al*., (2018) as part of cultural enshrinements expected to improve knowledge of sustainable construction within the industry. This was also confirmed in this study. Sensitisations and trainings were advocated for to initate both people within and outside the industry with the basic knowledge and benefits of sustainable construction practice.

8.3.2.2 Lack of policy enforcement and educational issues were highlighted by Davies and Davies (2017) as a big challenge. Participant 7 indicated that the absence of governments' laid down plan or strategy for stakeholders to follow is a challenge. There are no short term to long term goals of the Nigerian construction industry concerning sustainable construction, hence there is a gap as knowledge of sustainable construction is not being taught to incoming professionals. This was a common comment by particiapnts 2,5, and 11.

8.3.2.3 The Lack of an adequate and sustainable building code as referred to by Oribuyaku (2015) and Ogunbiyi (2014) emanated as a challenge here as well. There are problems of enforcement of the existing building code stated participant 1 and the formulation of a new sustainable building code is not exactly forthcoming unless underlying issues with the non performing building code are resolved (participant 10).

8.3.2.4 The lack of political will from the government to get things done within the industry and economy at large was not distinctly identified through the literature but it is identified from the field interview. Participant 2 stated that ''*it is the lack of political will to get things done that encourages corruption and a lukewarm attitude within the industry*.'' Participant 6 responded that, ''*if the government wants something implemented, it gets implemented and that 'political will' is very important to the implementation of policies in a democracy*''.

8.3.3 Benefits offered by Sustainable Construction practice

Benefits associated with sustainable construction practice in the area identified from this study (indicated in Table 8.4) include improvement in quality of life of the end users, healthy living and general wellness, improvements in the capacity, growth and productivity of the construction industry generally, overall reductioin in costs of maintenance and minimisation/ convertion of wastes generally, and the production of a cleaner environment for the citizenry. These identified benefits agree with some of the ideas raised by Akadiri, *et al*., (2012) in the literature as it relates to improvements in the quality of life of the citizenry.

Table 8. 4: Qualitative Analysis Matrix on theme 3

Issue	Evidence			
	Interviewee's	responses		
Benefits of sustainable construction practice	''Benefits are limitless but cleaner environment, improved health, improved Quality of life,	''It creates more jobs and gives buildings that are more easily maintainable.''	''helps the construction industry to grow and provides quality product to all stakeholders in the	'Builds value by reducing maintenance

life cycle costs form a part.'' – Participant 1	– Participant 4	industry because the construction industry has a serious impact on economy of a nation. – Participant 11	costs and develops capacity of local engineers.' – Participant 5
''Reduce the whole life cycle cost of a construction project and improving the health of the end users of the projects.''—Participant 9	'Leads to reduction in cost, Environmentally friendly. Increased productivity Increase quality of life and improved health minimise wastage.' — Participant 8	'Improved living, improved maintenance cost and overall quality of life' – Participant 2	''It improves the quality of life, productivity and performance of the people Sustainable healthcare waste management system, and facility management.'' – Participant 10
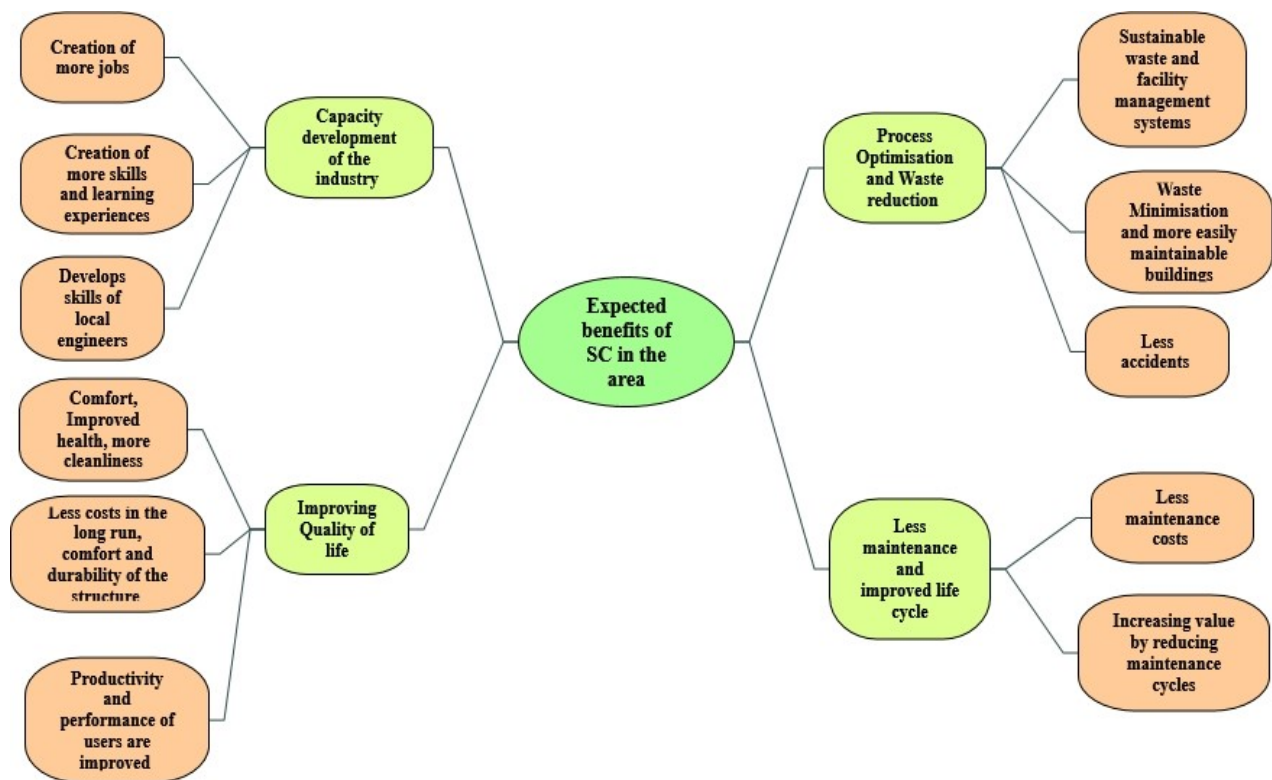
Figure 8.2. Mind map highlighting expected benefits of sustainable construction iin the area (Theme 3)

8.3.4   Status of the Building Code

The building code was generally acepted not to be in full active use except in cities where minimally utilised. This agrees with the views and concerns raised by Ogunbiyi (2014). Various reasons are highlighted in Table 8.5 for its non performing status which includes its stand as a regulation versus being an enforceable law as offenders of the building code generally go unpunished.

Table 8.5: Qualitative Analysis Matrix on theme 4

Issue	Interviewee's	responses		
		Evidence		
Status of the existing building code	There may be Building codes in Nigeria, but its implementation is limited only to major projects and urban developments – Participant 8	'Not adhered to, because it is not a law. Resistance even from other relevant bodies within the industry (Planners and Architects).' – Participant 4	No, being a perception thing. Some think it's a guide, some think it's a Law. –Participant 2	At an embryo stage as lack of legislation hinders. Not yet effective, but having it is a good step in the right direction – Participant 1
	The Nigerian Building code is not actively implemented as Projects are being constructed without approval and people tend to build anyhow and offenders go unpunished. --Participant 9	As at now the building code has a lot of lapses.some professionals in Nigeria (especially engineers) in the industry refused to adopt it because they felt they did not contribute to its content -Participant 11	Not many people know much about it until things happen, that people refer to it. – Participant 2	The code is good, but theoretical without ability to do, also personal professional interests are hindering the implementation –Participant 5
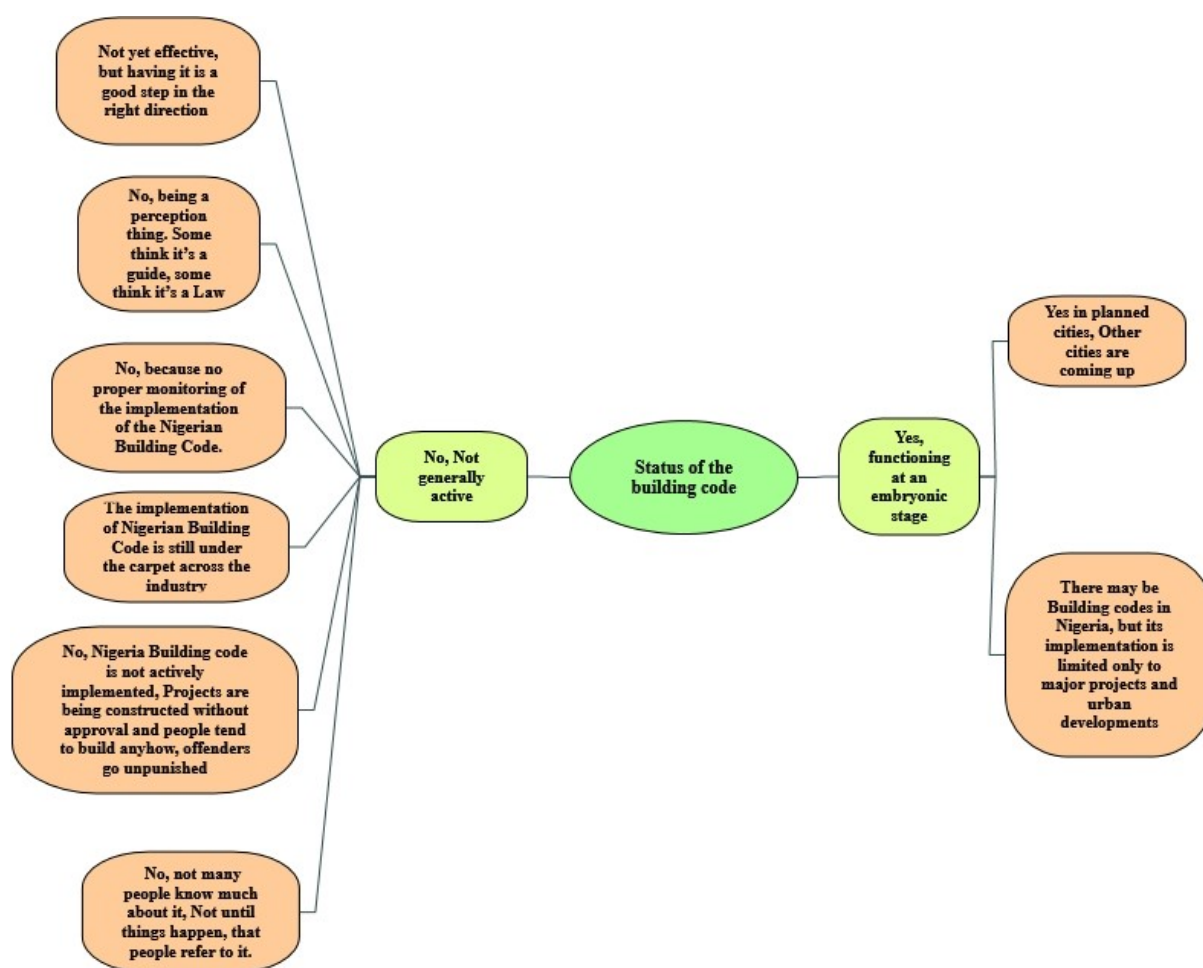
Figure 8.3. Mind map highlighting the status of the building code (Theme 3)

There are concerns of lack of adequate synergy among the professional stakeholders and interests to ensure its adequate workability and implementation. Implementation is seen as the key problem for the suceess of the existing building code in the country. Personal and professional interests clash and there are some elements of resistance as commented by participants 5, 4, and 11.

The uncertainties surrounding the document (building code) whether as a policy, law or regulation is also evidently expressed by participant 2. Professionals do not exactly know how to deal with it, despite the fact that they are supposed to be the implementers. This over time has created a situation where people build without any direct guidelines and there is no penalty for a violation of the stipulations of the document. The fact that the Nigerian building code is also a prescriptive document more focused on compliance criteria and not a performance based building code focused on outputs is also currently a structural setback for the document.

8.3.5   Practicing Sustainability in Nigerian Construction Practice

Outcomes from this theme were coded into professional inputs and government inputs to capture the efforts needed to ensure sustainabie construction in practice as shown in Table 8.6.

Table 8.6: Qualitative Analysis Matrix on theme 5

Issue	Evidence		
	Interviewee's	responses	
Improving sustainable construction practice a) Government inputs	''Subsidies and reduced costs, discouraging importation and allow local research and production to grow, Research aimed at commercial production by the Government.'' – Participant 1	We need to make sustainability a way of life, culturally, teach it in schools. It requires a lot of seriousness and consistency. – Participant 2	Regular evaluation of the current policy to give improvements –Participant 10 The publication of the existing policies, most people don't know then general orientation–Participant 4
	Ensure existing laws are implemented and clear policy directions that won't change irrespective of the political party in power should be put in place --Participant 6	Artisanal skills must be prioritised --Participant 5 ''Awareness and trainings.'' – Participant 9	Educating and training the people involved in the implementation of the policies – Participant 11
b) Professionals' inputs	Research and Development on improved and enhanced alternative building materials and development generally.'' -- Participant 1 The level of professional in practice cannot lead us to sustainable construction because of inadequate training --Participant 5	From design, active and passive components must be incorporated. specifications and materials usage must be improved once the knowledge base of the professional increases.'' --Participant 1	Improvement in professional practice and artisanal training and improvement in material usage.'' --Participant 3 ''Professionals in the built industry should come up with appropriate laws and professionals should be trained on the benefits of inputting such.'' – Participant 8

8.3.5.1 Government inputs: As observed from Table 8.6, policies and the focus of government on sustainable construction must be clear and not change with political change of power, also policies on tax subsidies, reducing costs and discouraging importation. The government must also allow local research and production to grow through commercial production and embrace sustainability culturally as it requires a serious and consistent approach. Awareness, trainings and retraining of policy implementers within the industry and a general orientation is also needed on the part of government to ensure sustainability is 'home grown' within the industry. The need for a general reorientation was discussed in the literature.

8.3.5.2 Professionals' inputs: for the professionals and the professional institutes, improvements through awareness, trainings and upholding professional standards, artisanal trainings, inputting sustainable construction deliverables from the design stage are envisaged. Local research on adaptation and enhancing alternative building materials use and development is also key which was iterated by (Bungwon, Dabo and Ishaya, 2018).

8.3.6   The Need for Strict Regulations

Outcomes from this theme were unanimous in specifying that strict regulations are essential the Nigerian construction industry as shown in Table 8.7.

Table 8.7: Qualitative Analysis Matrix on theme 6

	Evidence		
Issue	**Interviewee's**	responses	
Requirement for strict policy regulations on sustainable construction	Yes, People must know there are consequences for their actions and inactions. People do things cos they know they will get away with it. we need to be consistently strict – Participant 2	This will be improving the quality of output in the industry.– Participant 7 Very well, that is the key. – Participant 9	Yes, enforcement must be strict –Participant 10
	YES, People fear the law and only tend to respect the authority. --Participant 9	Before we get to strict policy, we need to teach. It's a process.—Participant 1	Yes. But there's need for stakeholders to be educated – Participant 8
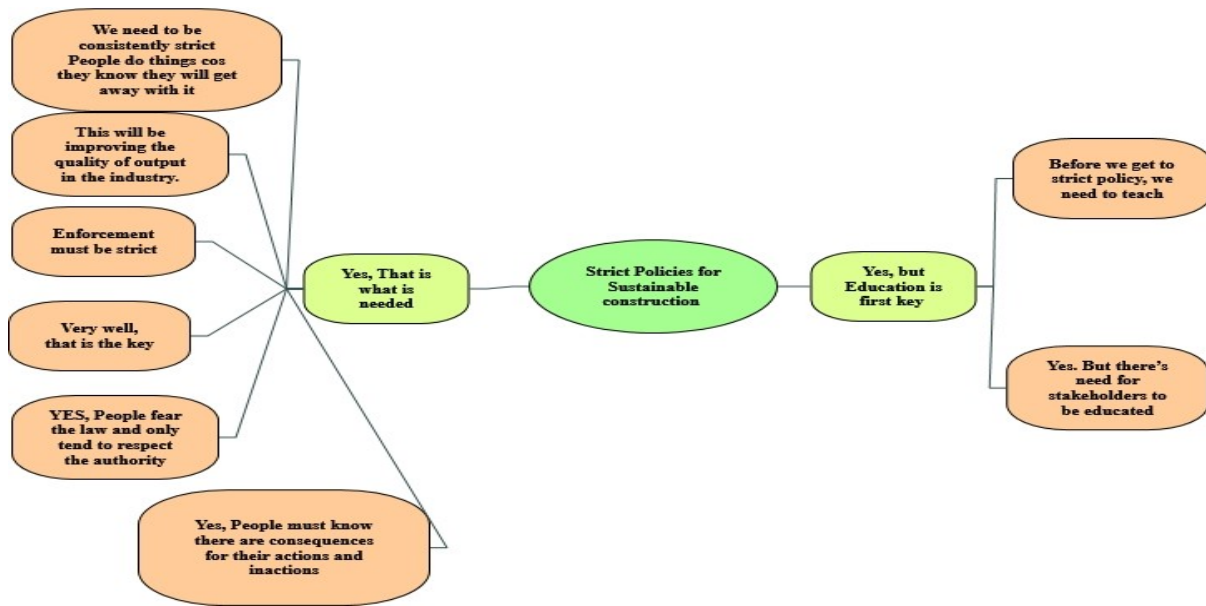
Figure 8.4. Mind map highlighting the need for strict policies for sustainable construction (Theme 6)

Strict policies and consistent regulations on sustainable construction and punitive measures for defaulters were stressed in the interview sessions. All the participants agreed that there must be consequences for unlawful actions in line with government's plans for the industry. However, adequate training and orientation of the public will have to be done before the regulations can come into full force as advised by respondent 1.

8.3.7   Input of stakeholders to drive sustainability

The input expected of stakeholders to drive sustainability in the Nigerian construction industry are spelt out for all stakeholders as shown in Figure 8.5 and explained below;

8.3.7.1 Professional institutes and professionals: Professionals need to be more professional in their approaches and offering advice to clients mostly, interdisciplinary research within the industry is also advocated for. The need for synergy among professionals is also stressed. Professional institutes are also expected to stand up to their responsibilities and engage more in research, publicity and synergy moves among fellow professional institutes.

8.3.7.2 Government as a stakeholder: Government needs to create policies for the industry. This is stressed in the literature by Akadiri *et al*., (2012); Mbamali and Okotie (2012) and Ojo *et al*., (2014). The creation of awareness and publicity is also a drive as contractors and other practitioners within the industry will always look forward to the government for direction and patronage. Investment in research and development on policy adaptation is also integral as noted by participant 4 so that '*policies are not just lifted from Europe and other developed nations*' without adequate consideration and adaptation for

local use in Nigeria. Proper monitoring of compliance and enforcement of an improved and sustainable building code for the industry is key to the success of any proposed plan for the construction industry.
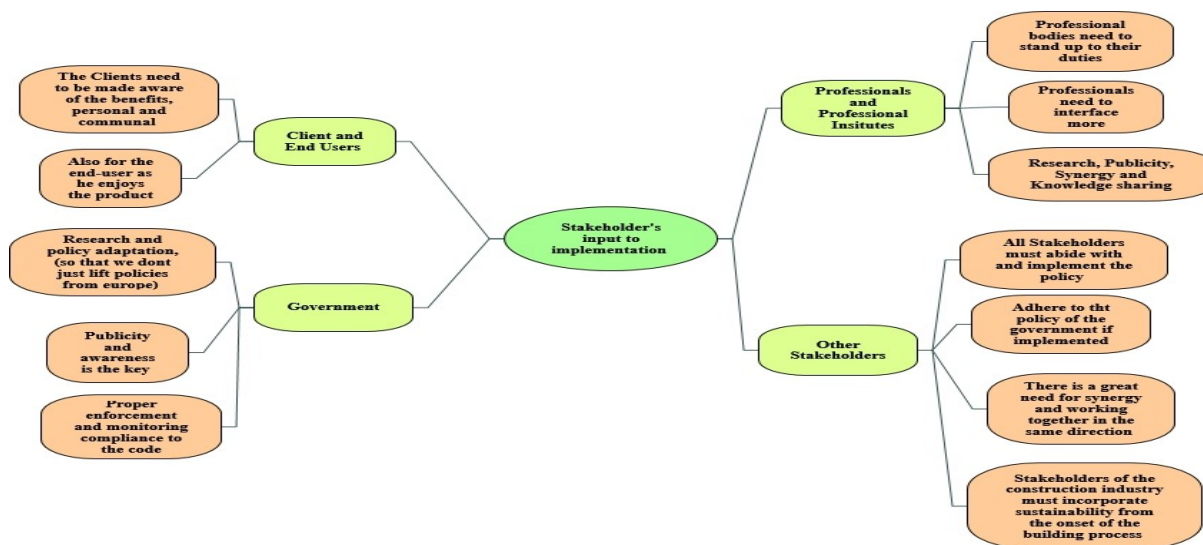
Figure 8.5: Mind map highlighting stakeholders' input to sustainable construction implementation

8.3.7.3 Client and end users: Clients need to be made aware of the inherent benefits in implementing sustainable construction as it affects their quality of life and comfort. This is more evident in the sense that maintenance costs are reduced and the comfort of the users of the facility is harnessed.

8.3.7.4 Other stakeholders: Compliance with the minimum requirements for the industry is to be expected from this group of actors in the industry, especially developers. Adherence to the policy is key and the need for coordination among all players within the industry throughout all the stages of construction.

8.3.8   Implementation of sustainable construction through the municipality

On the possibility of implementing sustainable construction through the smallest unit of government in the country, the identified themes are presented in Table 8.8.

Table 8.8: Qualitative Analysis Matrix on theme 8

Issue	Evidence		
	Interviewee's responses		
Exploring the possibility of Local government/ Municipality implementation and enforcement of sustainable construction	''The local government is best suited, but the capacity could be a challenge right now.'' – Participant 1 ''They are not active The Local Government should be as they are closer to the people.''	''Yes, the local government captures it all people still live more in Local Government Headquarters If the local level can be active, it will greatly reduce the negative effects at the federal level but, it is currently the weakest unit of government.''	''They are corrupt, they compromise easily. They are not also adequately motivated to carry out the enforcement They are poorly remunerated, so they are exposed to temptation of bribery and corruption.'' –Participant 11

– Participant 4	– Participant 2	''They need more improvement Government must ensure their active participation compliance being at the grass root.'' – Participant 7	
''They have not been active, and more can be done No, they have not been active They can be the needed agent as they are closer to the people.'' – Participant 3	''Yes. The LG is not empowered though.'' – Participant 8	''Local government autonomy is critical to implementing laws at the grassroots.'' --Participant 6	

It was generally agreed that the local government is best suited for the starting point for implementing sustainable construction as the local governments are closer to the people and it spatially covers the whole country so much so that there is no place in the country outside the boundaries of the local government. This agrees with the literature in suggesting that the local government could be effective in implementing sustainable construction (Nwaokoro and Onukwube, 2015; Tunji-Olayeni, *et al*., 2018). However, the current capacity of the local government to handle the implementation of sustainable construction at its current state of being inadequately staffed and generally ineffective was doubted as they have not been active. Also, the fact that they can be easily compromised is raised in that they are easily exposed to bribery and corruption. This concern was not raised in the literature.

8.3.9 The need for a construction board for the Nigerian construction industry

On the need for the establishment of a construction industry board for the coordination of activities within the industry, responses are captured as presented in table 8.9.

Table 8.9: Qualitative Analysis Matrix on theme 9

Issue	Evidence Interviewee's	responses		
Need for a Construction Board	Maybe, but there exists so many bodies and agencies already even with over-lapping functions another layer of bureaucracy is not needed. We need to allow existing structures to be empowered. Except if it's just to serve as a meeting point. –Participant 1	There are some fundamental issues that need to be resolved professionally before the board can work successfully. The identification and roles of existing agencies need to be well defined to prevent over-lapping functions. -Participant 2	Yes, seriously needed so that knowledge can be garnered. —Participant 4 Yes, there is need for this body for more improvements in the construction sector. —Participant 7	Coordination of inputs is generally being done right now at the Federal Ministry of works level. –Participant 3
	I may subscribe to this but may bring bureaucratic bottleneck in project implementation. – Participant 8 Yes, just like the army, the coordination needed within the construction	The existing likes (e.g., federation of construction industry FOCI) can be given power through legislation. It could also be empowered through training and retraining and financial	It still depends on who drives the agency. There are so many existing agencies expected to bring people together within the industry. Creating a board now may just be duplicating responsibilities and	No. the industry already has enough bodies to handle this situation. They only need powers by the government. – Participant 10

industry is very key to get things done. –Participant 5	appropriation. — Participant 11	creating more bureaucracy in the industry. – Participant 6	

The general consensus among the respondents is that the construction board is a good initiative as it gives a central focus and coordination to the industry, however, there are some fundamental issues that need to be resolved before the board will function successfully. Respondents believe there are enough bodies within the Nigerian construction industry that can function very well in the capacity of coordination within the industry such as the FOCI and the Federal Ministry of works and other agencies even with overlapping functions, hence the need to adequately define the extent of these bodies. The creation of a new one may just add a new layer of bureaucracy that is not exactly needed at this time as expressed by respondent 1; ''*We need to allow existing structures to be empowered, except if the board is just to serve as a meeting point.*'' the second respondent also remarked that ''*the identification and roles of existing agencies need to be well defined to prevent over-lapping functions.*'' This slightly agrees with the views of (Nwaokoro and Onukwube, 2015) in the literature that if extant laws are revised to meet modern trends and given the expected legal backing, the expected improvements will be achievable. Respondent 6 explains that ''*It depends on who drives the agency. There are so many existing agencies expected to bring people together within the industry. Creating a board now may just be duplicating responsibilities and creating more bureaucracy in the industry*.'' Clearly identifying the duties of the board will be a cardinal point to note as commented by respondents 2, 4 and 7.

8.3.10 The need for an active green building council
An active green building council is very important for the awareness, knowledge improvement and sharing on sustainability. It is identified as a motivation for sustainable construction. Responses are evaluated below.

Table 8.10 : Qualitative Analysis Matrix on theme 10

	Evidence			
Issue	Interviewee's	responses		
Need for Green building council	Some institutional arrangements exist, but they have not been fully harnessed to deliver. — participant 2 Strategic partners are coming in the areas of power like the new Building energy efficiency code. – Participant 4	Well, we are due to have one. Like I said previously, the manpower is readily available just need government powers to start functioning. – Participant 10	Government should give it more awareness. -- Participant 9 This is good and will improve the comfort ability of people, result in healthy living and output of people will also increase. –Participant 7	As it is in the country, many people are not aware, save the capital cities. There is a greater need for the Green building council as the awareness is very low right now. – Participant 6
	It's a good move considering the benefits also building codes can then be updated to include	A lot of research is needed at our local level. we may adapt and localise from	It is a welcome council. The move is to set up a committee that will draft a bill to the national	Green is the way to go! The cost of operation and maintenance

green building construction. –Participant 8	developed climes who have been successful at it. –Participant 3	assembly, to back it up with an act for proper implementation. The committee must include all the stake holders and the professionals in the industry. –Participant 11	(running cost) is also important to understand. Electricity demand, indoor air quality etc., all of these will be addressed and reduced by the Council. –Participant 5

The green building council is seen as a welcome idea however, there is this unwritten understanding that the green building council should be at the forefront by giving it the needed awareness to grow as noted by participants 9, 10 and 11 in the table above. This is not exactly the view expressed in the formation of a green building council as the council is a non governmental, non statutory and non-profit organisation as expressed in the literature. There are some existing institutional groups but they have not fully harnesed their capacity due to the a lack of adequate synergy and coordination among institutional players in the industry. This has rendered such groups inactive. These gaps are also noted by Ude and Ude (2014) in the literature. Expectations are high within the industry as to the need for sustainable construction practice as remarked by participant 5.

8.3.11 The need for synergy among all stakeholders in the construction industry

The need for synergy and adequate collaboration among construction professionals and practitioners is highlighted in this theme. The outputs are discussed in Table 8.11

Table 8.11: Qualitative Analysis Matrix on theme 11

Issue	Evidence		
	Interviewee's responses		
Need for synergy in the construction industry	Synergy is needed. professionals should play their own role. --Participant 1	Yes, without synergy everyone is working on his own. As it is right now, there is not enough synergy, especially as it means the person who gets the contact has the control until they run into the need of other professionals. –Participant 4	Yes, adequate synergy will almost eradicate all the problems. An error/ inadequacy of the building code is that the client's interest was not captured at the initial phase. Participant 5	Yes, there should be collaboration among the construction and engineering practitioners. – Participant 10
	Definitely…teamwork does it, unfortunately, in this clime, more of what's obtainable is territorial control. There is a conscious need to improve on it as professional boundaries are very clear. –Participant 2			There's need for professionals to work together for common goals. – Participant 8
Can the synergy help in implementating a sustainable construction policy?	Very urgent need. – Participant 11	Some people feel they are more important than the others whereas they are supposed to be a team. –Participant 6	Yes, there is need for synergy especially at the information sharing stage, from the design stage all through the implementation stages. – Participant 3	Yes, there is an urgent need. —Participant 5
	Yes, because there will be unity of purpose in supplying sustainable	Very well, it will go a long way. —Participant 11	Definitely, yes! – Participant 8	Yes, it will help a lot in the policy implementation for sustainable

	solutions to arising problems. –Participant 4		This will help and assist in the implementation of sustainable construction policy. –Participant 7	construction. – Participant 10
Point of need of the synergy	At all levels and stages of the construction. Mutual suspicion still exists among professionals. Hence at all levels. -- Participant 1 This should be at all level of project implementation. –Participant 7	More at the political and impediment. – Participant 2 At all levels, and everyone should mind his professional disciplines squarely. -- Participant 5	Across board at all levels. –Participant 4 At all levels. –Participant 8 it is needed at all levels. – Participant 11	It is required at all levels for project lifecycle. -- Participant 10 All levels. Participant 3 Project level. Participant 9

The need for synergy and effective team work among all construction professionals and workers within the construction industry was stressed by almost all the respondents. It is regarded as a fundamental problem that has affected the implementation of the building code and all policy documents within the industry. This agrees with the opinions of Ogunbiyi (2014) and Oribuyaku (2015). The idea of professional boundaries and territorial control is seen as an outcome of the lack of adequate synergy between and among professional institutes, contractor organisations, artisans etc. as mutual suspicion still exists even among professionals in the industry. This synergy is needed throughout and at all levels and stages of the industry for adequate policy making and implementation. It is also needed for adequate information dissemination as observed by participant 3 who stated ''*certain professionals feel they are more important in the process of the execution of the project than the others*'' especially if they are the contact person with the client authority. This sentiment was shared by participants 4 and 6. This confirms what was discussed in literature (Ogunmakinde *et al*., 2019).

Respondents believed that adequate synergy and collaboration will adequately help in implementing and maintaining a sustainable construction policy for the Nigerian industry as there will be unity of purpose in resolving any issues that may arise. This can be fostered by the activities of a construction board and improved industry policies for the professional bodies and active stakeholders in the industry.

8.3.12 The roles of government as a regulator of the construction industry

The construction industry is a part of the economy under the monitoring of the government and the industry plays a major part in the facilitation of built assets. The expected roles of government as a regulator of the industry are discussed in Table 8.12.

Table 8.12 : Qualitative Analysis Matrix on theme 12

	Evidence		
Issue	Interviewee's	responses	
Role of government as the			Passing the law of National building code

| regulator of the industry | Legislation, improved policies, incentives/tax reliefs action based efforts as against several conferences. –Participant 1

Make sure all the laws are implemented and that there is adequate punishment for violation. –Participant 4

Government must set up agency to regulate and monitor the implementation of the policy on sustainable construction process. –Participant 7 | Government should make building codes and enforce it. Participant 9

Provision of an enabling environment for the private sector to drive the economy. Creating policies and financial incentives to make access to financial capacity nearer. Revising extant policies and bringing up new policies where necessary. Land Use Act, Mortgaging options. –Participant 6 | and its enforcement. –Participant 10

Preparation of regulations, Planning and approvals monitoring construction, monitoring usage, correction of infractions and punitive measures. --Participant 3

Government should be a facilitator and is not expected to be an active participant because of vested interests. We need to be patriotic in nation building as private hands will manage resources better. –Participant 5 | Making and enforcing laws. Participant 8

Policies must be very clear and unambiguous. Professional boundaries must also be clear. The problem of political will. If everything is on ground and there is an absence of the political will, there is a problem. –Participant 2

Financial role, empowerment and enforcement role. –Participant 11 |
| Does Government have a role specifically in sustainable construction | Formulate policies and back it with laws. –Participant 4 | | Yes. For enactment of appropriate law and enforcement of such law. –Participant 8 | The government has a major role to play. –Participant 9 |

The roles expected of government as the regulator of the industry are examined by the respondents. The need for improved policies for the industry was highlighted by participants 1,3,4 and 8. This is necessary to face the recent challenges and innovationis that are coming into the industry and are being influenced by organisational and institutional normative and mimetic isomorphic policies. Tunji-Olayeni *et al*., (2018) agrees with this. However, the government must be proactive in this area so that there is enough regulatory backing to ensure implementation success. '*the government should be a facilitator and not really an active participant.*' Participant 5 state that there should be a '*provision of an enabling environment for the private sector to drive the economy. Creating policies and financial incentives to make access to financial capacity nearer and revising extant policies and bringing up new policies where necessary.*' The sentiments of revising of extant policies and bringing up policies where discussed by Nwaokoro and Onukwube (2015).

The need for incentives and tax reliefs was also raised by some of the respondents especially respondent 1 and 6. This move should ordinarily follow the implementation of policies, to ease the strain on importing sustainable materials and drive the sustainable construction policy further. This drive will also inform local research for improvements in local research and development in sustainable construction practice. Participant 11 puts it as the financial role, empowerment role and enforcement role.

Action based efforts as against conferences and symposia that may not yield much but will just add to the theoretical literature on sustainable construction in the country. The need for pragmatic approaches to the implementation and realisation of improved construction processes in the industry was highlighted.

New building codes with adequate enforcement mechanisms and punitive measures for defaulters were observed as very necessary as respondent 1 puts it and they should be clear and unambiguous to ensure easy implementation as remarked by respondent 2. This opinion was expressed by Ogunbiyi (2014) and Onuoha (2018) as well.

Government must also ensure that professional boundaries are respected and infringements punished. This is an underlying issue that has always held down harmonious working relationship within the industry. Professionals and professional institutions must make the distinctions in their briefs and dealings with clients.

On the need of the government specifically on sustainable construction, respondents were unanimous in asking the government to make policies and ensure that the enforcement were done appropriately. This is a major move that ensures that there is an appropriate transition towards sustainability in the industry.

8.3.13 The roles of government as a client of the construction industry

The roles expected of the government as a client is examined in Table 13. As the government is also a major client of the industry and a critical stakeholder in the provision and maintenance of public buildings and infrastructure for the improved quality of life of the citizenry.

Table 8.13 : Qualitative Analysis Matrix on theme 13

	Evidence		
Issue	Interviewee's	responses	
Role of government as a Client in the industry	Government must practice what it preaches through its projects. It is critical to walk the talk. As building with this new evolving city. – Participant 1	Yes, many things in the industry must be driven substantially by the government. Government must also provide the enabling environment even as a client of the industry. –Participant 2	Yes, as a client, professionals working for the client (government) must be able to clearly articulate what they want to the contractor. Currently, personal interests outweigh the national interest in project delivery. –Participant 5
	The government has a major role to play in ensuring sustainability is achieved. – Participant 9	Yes, Nigeria being a developing country, Government is a major client to the industry and as such has a lot of roles to play. For now, gradually, the private sector may take it over eventually but for now. Government is key. – Participant 11	The client should have a say being the financier and end user of the project. –Participant 3
	Yes, On public projects. Government should lead by example. –Participant 4		

The client is a very powerful stakeholder in the life of any project, based on financial provision,

management of resources and eventual usage of the public property. The government must lead the sustainable construction process by ensuring that it "*walks the talk*". The government must make major inputs especially on public projects as they serve as the facilitator for the public. As remarked by respondent 11, the control may later move to the private sector through private public procurement or private finance initiatives, but as the country is still in a developing phase, government must make active efforts to ensure that the best sustainable plans are laid. Governments should lead by example.

Professionals representing the government (public consultants) should also be able to clearly articulate the required ideals on behalf of the government. The mechanism should be able to evaluate the inputs of the professionals in the best interests of the public and the main intentions of government in the provision of quality infrastructure to improve the quality of life.

8.4   Chapter Summary

This chapter has reported the outputs of the semi structured interview held with selected policy and decision-making professionals of the Nigerian construction industry on their perspectives and insights on the prospects of policies on sustainable construction practice in Nigeria and the underlying factors on why the practice of sustainable construction is generally low in the country. Deeper insights that may not easily be captured by a quantitative study were revealed such as the need for extensive awareness and policy adaptation and the removal of existing bureaucracies in the current construction space in the country among others. The next chapter reports outputs from focus study groups conducted with construction practitioners and staff from some construction regulatory agencies in Nigeria.

CHAPTER 9
RESULTS FROM THE FOCUS GROUP INTERVIEWS

9.1   Introduction

This chapter describes the results from two focus group interviews conducted in Lagos, Nigeria. One of the focus groups was conducted with diverse professionals with on-site experience while the other one was conducted with professionals largely engaged in monitoring and enforcing best regulatory standards on construction practice in Lagos state that is the Lagos state building control agency (LASBCA). The aim of this chapter is to assess the level of sustainable construction practice and determine policy barriers and drivers in line with objectives two, three and four of this study. The group studies were conducted to structurally understand the current level, challenges and awareness of sustainable construction practice in the industry, to examine existing policies and policy documents with the rate of use and the level of transformation and to check the impacts of policy drivers identified from literature in the field. The expected roles of government and stakeholders in the policy and practice of sustainable construction are also highlighted.

9.2   Methodology

This study was inductive and intended to elicit hands-on responses from practitioners in the field in the construction industry who have the experience relating to existing policy implementation and corresponding industry response. Questions relating to sustainable construction policy formulation and implementation were then built in arising from their general knowledge around the subject matter. Respondents included architects, civil engineers, builders, quantity surveyors, services engineers and urban planners. It was expedient that professionals come from varied professional backgrouunds and that they actually work in different sectors of the industry to encourage the robustness of the discussion.

The focus group studies were conducted to investigate and pre validate research findings from the literature reviews and the earlier performed interviews from another set of seasoned professionals on underlying reasons why there is a low and unresponsive attitude to policies and especially relating to sustainable construction within the industry. Professionals were purposively selected based on their years of practice, depth of experience on expected deliveries of sustainable construction. The opinion of professional practitioners especially in their sector of employment within the industry were assessed. Being a pragmatic study, the robustness of different perspectives of professionals within the same industry generated diversity to the discussions. To this end, a list of construction professionals staff in Lagos State Building Control Agency (LABSCA) were involved in focus group 1. Staff from private consultancy and contracting outfits were involved in focus group 2. Invitations to participate and follow up calls were sent through e-mail and phone calls. The Higher National Diploma (HND) and Bachelors

degree is the minimum criteria for employment for professional work in the Nigerian construction environment and as such was the basic qualification of the total respondents. Other respondents having masters degrees and other qualifications were also involved.

A focus group discussion should have between 5-8 respondents so as to have robust discussions and allow all participants have an input in the discussion (Krueger and Casey, 2015). Eight respondents were available in the first focus group and it was conducted on the premises of the Lagos state building control agency while the second focus group consisted of seven respondents and it was conducted in the board room of the construction site where site meetings were held. The focus group discussions took about one hour each. Two focus group discussions were considered adequate as all the questions were addressed satisfactorily. Adequate permissions were given prior to the approvals for the discussions.

Data was collected through digital recording of group discussions, taking notes and observation of group reactions and interactions. The recorded data was processed by transcribing the collected data into acceptable formats for the software. Collation, organisation and coding of the data into corresponding contents were subsequently done and built around the research questions. Emerging themes were group together structured, analysed and interpreted using Nvivo 12. The profiles of the focus group respondents are represented on Table 9.1 and 9.2 respectively.

Table 9.1. The demographic details of the focus group 1 participants

Interviewee	Profession	Age	Gender	Years of Experience	Place of work
Participant 1	Builder	>30	Male	10	LABSCA, Lagos (Enforcement Unit)
Participant 2	Architect	>30	Male	13	LABSCA, Lagos (Design Unit)
Participant 3	Civil Engineer	<35	Male	12	LABSCA, Lagos (Design Unit)
Participant 4	Architect	28	Male	5	LABSCA Lagos (Design Unit)
Participant 5	Quantity Surveyor	<40	Male	10	LABSCA, Lagos
Participant 6	Construction Manager	35	Male	13	Private Practice, Lagos
Participant 7	Builder	35	Female	13	LABSCA, Lagos (Safety officer)
Participant 8	Urban Planner	35	Female	15	LABSCA, Lagos (Planning Unit)

Table 9.2: Focus group II Participants

Interviewee	Profession	Age	Gender	Years of Experience	Place of work
Participant 1	Builder	35	Male	13	Private Practice, Lagos
Participant 2	Mechanical Engineer (services)	30	Male	8	Construction Company, Lagos
Participant 3	Civil Engineer	35	Male	10	Private Practice, Lagos

Participant 4	Architect	30	Male	10	Private Practice, Lagos .
Participant 5	Civil Engineer (Site Supervisor)	35	Male	12	Construction company, Lagos
Participant 6	Quantity Surveyor	30	Male	8	Private Practice, Lagos
Participant 7	Builder	35	Male	10	Private Practice, Lagos

9.3   Discussion of findings

Results obtained were coded using Nvivo 12 from QSR limited. The coding strategy used is in line with the standards of the software. Responses were ascribed and coded under likely themes and content analysis done to evaluate the responses. Four major themes and several subthemes thereunder emerged from the analysis and they are firstly, perception, challenges and benefits of sustainable construction practice generally and within the construction area, this was important to assess the local challenges and understanding related to their varied practices. The second theme centered on the low usage, challenges and ways of improving the usage of the Nigerian building code. The expected roles of stakeholders especially highlighting governments' role as a regulator, government as a client and all involved stakeholders on improving sustainable construction practices through policies and implementation mechanisms came up as the third theme. The fourth theme discussed all the identified drivers for sustainable construction practice from the literature review and their practicability from the realistic experiences of the respondents. These are discussed below.

9.3.1   Perception, Challenges, and Benefits of Sustainable Construction

Respondents were asked questions to assess their familiarity with the themes of discussion, their perception of sustainable construction practice and perceived benefits and challenges especially in their immediate environment.

Table 9.3   Perception, Challenges, and Benefits of Sustainable construction

	Evidence			
Issue	Focus Group I		Focus Group II	
Benefits of sustainable construction	Value for money. Re-use of existing resources and reduction in consumption. – Respondent 1	The building or infrastructure lasts longer with reduced maintenance. – Respondent 4:	Sustainable construction gives economy eventually and improved long-term comfort. Respondent 1	Making the best use of the environment using designs, materials and processes. – Respondent 4
	Earning for the government, periodic assessments and certifications are done. –Respondent 2	The client is assured of building right and improved comfort for the end users. – Respondent 3		
Major challenges of Sustainable construction	The general attitude of the industry does not support long lasting but quick solutions that		Initial costs are high. – Respondent 1	*On ways to improve*: Respondent 5: Training especially on site for artisans and technicians

	may not be dependable on the long run, there is need for more awareness. – Respondent 2		A lot of the people are not aware of the benefits of sustainable construction. – Respondent 3	Respondent 6: Sustainable product merchants and vendors need to enlighten people.
			The educational and exposure level of the artisans, technicians is still low and same applies to some professionals as well. —Respondent 4	
Perception of Sustainable construction practice	People are coming up especially in this location, Planning and control mechanisms are being introduced. Being a Building control agency, awareness is generally on. – Respondent 1	As an architect, the level of practice is low, especially in residential buildings. Commercial and industrial buildings are slightly better. Making statutory laws will also help. – Respondent 4	Client knowledge base need to be improved. Cost is also a factor. There are no alternative materials in the market. – Participant 3	The knowledge is average, however, the implementation through improved building materials is still low. – Respondent 1

9.3.1.1 Brief on knowledge base and readiness to practice sustainable construction

Focus group 1 respondents have some understanding and a readiness for the full uptake of sustainable construction in the industry, they can highlight some of the specific advantages, relate with existing challenges and assess the perception level of practice within the industry. The perception is that the level of practice is still low but there are enlightenment efforts especially by members of the Building control Agencies in areas where they exist. The idea that residential buildings are mostly built to low sustainability standards compared to standard commercial buildings. The focus group held with practising professionals on site also agree that there is a low implementation and perception generally among clients but basically due to clients requirements and the desire to spend as little as possible. However, cost is also a factor being considered by both clients and professionals as most of the materials are often imported thereby increasing the costs when compared to local counterparts in the market. This agrees with the literature that there is evidence of knowledge of the basics of sustainable construction theory within the Nigerian construction industry especially when compared with the volume of published texts on sustainable construction (Ojo *et al.,* 2017), however the people are not really compelled or see the benefits so much to implement sustainable construction in their building briefs. Benefits associated with sustainable construction from the focus group 1 discussion tended towards the perceived benefits for the client that is lower maintenance costs, improved comfort and value for money and also to the government through earning more by periodic assessments and certifications. While earning to the government may not exactly be fundamental to the benefits of sustainable construction, it is understandable that the agency and work experience of the respondents of this particular group lies in implementing planning approvals, permits, standards, certifications and regulatory enforcement services which are pecuniary.

Focus group 2 discussion also revolved around long term economy, comfort and environmental improvement through improved designs, materials and processes. This speaks more to the construction industry probably because this discussion is happening with professionals who have more hands on site experience.

9.3.1.2 Perception of practice of sustainable construction

As reported from the focus group 1, the practice of sustainable construction in the Nigerian construction industry is still very low. Although people seem to be coming up through the actions and awareness embarked upon by the building control agency in the opinion of the respondents, there is a very urgent need for more awareness and making statutory laws on sustainable construction within the industry, which was also found by Onuoha *et al.,* (2017). As commented by respondent 4 in focus group 1 who happened to be an architect, residential buildings have a very low conformance with sustainable construction and standard improved construction practices. However, for commercial and industrial buildings, standards are more respectedly implemented.

9.3.1.3 Major Benefits of sustainable construction

Identified benefits associated with sustainable construction by both groups include the long term benefits associated with the economy sustainable construction gives and the optimised use of natural resources to build comfort, enhance living and improve quality of life generally. The fact that maintenance cost and discomfort is reduced, value for money and the assurance that the client is building right are expressed as the advantages sustainable construction offers. As opined by respondent 1 ''*Value for money and reuse of existing resources* which in turns lead to *a reduction in consumption of natural resources.*'' This was corroborated by focus group 1 respondents 3 and 4 who assert that ''*with sustainable construction, the client is assured of building right and an improved comfort for the end users of the product*'' and that ''*the building or infrastructure lasts longer (durability) with reduced maintenance respectively.*'' Focus group two respondents on the other hand believe that ''*sustainable construction gives overall economy in the long term*'' by respondent 1 and respondent 4 discussed that ''*sustainable construction makes the best use of designs, materials and processes to achieve comfort and an improved quality of life.*'' This agrees with the notion that sustainable construction increases the quality of life as expressed in the literature by Aghimen *et al.,* (2019) and Akinshipe *et al.,* (2019).

9.3.2 Major challenges of Sustainable Construction observed in the location

The respondents in focus group 1 agreed that the industry is currently prone to the attitude of quick solutions which may not be so dependable in the long term. Experientally as enforcers of standards, this comment was seen as a deterrent to sustainable construction practice owing to the fact that the desired economy may not be achievable as higher costs are eventually spent in renovations and higher maintenance costs by clients and end users. Hence the need for more awareness on quality and durability

of inputs into the construction process. This view was also expressed in the second focus group discussion as opined by respondent 3 that the fault may be due to the fact that *''a lot of people are not in the area are not aware of the benefits of sustainable construction yet.''* This in the view of the respondents may deter the idea of implementation of sustainable construction.

Focus group 2 respondent 1 opined that the initial costs of implementing sustainable construction projects are high in that area, this may be due to the fact that most of the products to be incoorporated into the building to facilitate sustainable construction will be imported from outside the country.

Another major challenge of sustainable construction implementation practically is *''lack of artisanal training and upskilling technicians and workmen for sustainable construction''* as identified by the focus group discussion 2 that comprised site professionals. Respondent 4 remarked that even some professionals are not left out of the need for extensive training and continuous industrial improvements especially as it relates to sustainble construction. Most site workmen were not trained in up to date apprenticeship systems and the need for them to upgrade their skills is becoming more evident. Trainings and awareness through training schools and on site experisntal learning were advocated as a way to mitigate the barrier for the workmen at differing levels of assimilation. The need for adequate training and capacity development for sustainable construction was stressed by Davies and Davies (2017). Respondent 6 also noted that there was a need for product vendors and merchants to enlighten prospective buyers highlighting the advantages of sustainable products over existing ones.

9.3.3 Challenges and issues around the existing Nigerian building code

In assessing the readiness of the industry to adopt sustainable construction, the need to assess the usage of the existing policy document was necessary among practitioners. Respondents were asked about their perception of the implementation of the building code, impacts of monitoring agencies, ways of improving the implementation, size of the current document and if there are any penalties for violation of the existing document.

9.3.3.1 Implementation of the Building Code

Respondents from focus group 1 believed that the building code is being implemented but that there is an urgent need to do more with regards to the improvement of the document and the regulatory and enforcement mechanisms that surround the implementation of the document nationally. The building control agency focus group insist that *''most sites must have professionals fully on site to ensure that the designs are adequately being implemented as professionals are likely to know more about the code than non-professionals.''* *''Professionals are readily available to offer their services which should ordinarily be in line with the building codes.''* opined respondent 1 in focus group 1. Highlighting one of their cardinal roles as a building control agency by indicating that they are making moves to insist that every site have on site professionals in the management of construction projects.

Focus group 2 respondents did not exactly agree that there was implementation of the code but largely believed that the implementation rate was non-existent noting that the only semblance of implementation was at the design approval stage with the planning authorities. This viewpoint is supported by the fact that focus group 2 discussants are on the ground and their day to day activities revolve round the sites. As observed by respondent 1 ''*If the building code is implemented, it would have been very nice, but that's not the situation as it's not largely being implemented.*'' Although *evidence of partial implementation exists* as some states such as Lagos do insist on compliance at the approval of plans/ preconstruction stage and requesting for lists of professionals on site as remarked by respondents 3 and 2 in focus group 1 and 2 respectively, developers do not implement these directives as remarked by Respondent 2 in focus group 1 as they are mostly profit (return on investment) oriented. In all, the essence of the building code has not been fully realised in allotting people to specific tasks within the Nigerian construction industry. This is suggestive of the need for more active stakeholder implementation and delineation of roles for specificity without creating unnecessary bureaucracy in the process. Nwaokoro and Onukwube (2015) recognised that there is very little activeness of the building code in Lagos state.

9.3.3.2 Monitoring of the building code

The study sought to understand the practicing professional's responses on the question of who is to actually monitor the implementation of the building code? This is borne out of the internal incoherence of management of the implementation process among the professional institutions as to delegating the responsibility to one of the bodies or to the government.

Opinions are varied in the responses of the participants; Respondent 1 started the discussion by stating that ''*the minimum quality standards must be maintained as the code defined and that the professionals are in a better position to monitor the implementation of the code.* Respondent *3* believed ''*each professional organisation should have its own monitoring team, so that checking can be done there and then on site.*'' Respondent 2 in agreement with the earlier comment also added that although it is necessary to have checks by professionals, ''*an agency should also be involved to be able to check onsite to know if truly the members are professionally registered.*'' The other opinion came from respondent 3 who identified a third option by stating that ''*each professional organisation should rather have its own monitoring team, so that checking can be done there and then on site.*'' It was generally agreed by participant 4 that the possibility of random checks by authorities generally puts the onsite professionals on their toes during the project.

The second focus group discussants on the other hand although also divided in their opinions presented the live scenario. Respondent 1 believed *both government agencies and professional institutions are necessary*. He further stressed that sometimes, "*officials from the government agencies do not*

understand the relevance of the process, as such, *professionals need to be involved in the process.*
Respondent 2 agrees that; *''it takes knowledgeable construction professionals to effectively manage the implementation process.''* Respondent 6 noted that although some monitoring agencies do come around on site, *their monitoring is not thorough*. This position was corroborated by respondent 7 who cited *''an instance where there was a glaring difference between approved drawings and the construction drawings on an ongoing site, the monitoring team did not even check.''* He further evaluated that *''pecuniary benefits often compromise the monitoring processes of the government agencies especially on health, safety and environmental practices on site''.*

This position of the second focus group in the interpretation of the study group presents the real-life situation as it often exists on construction sites while the first focus group relates more to the ideal expected situation. These positions are at variance with each other and it is understandable in the light of the study. These insights were not expressly stated in the literature, however, authors such as Oribuyaku (2015) and Ogunbiyi (2014) related that the implementation of the existing building code was one main challenge, these insights have further elucidated the underlying issues surrounding the monitoring of the building code.

9.3.3.3 Improving implementation of the building code

All respondents in the focus group 1 agreed that through enforcement of policies by the government especially to clients and developers, improvement in implementation of the building code can be achieved. The group also agreed that through *''the recruitment of professionals on construction sites as it is statutory in the location, the implementation can be improved as professionals expectedly know more about the implementation of the code than non professionals.''* While informing the discussion that the Lagos state has its urban renewal byelaws and urban areas byelaws for specific areas of the state respondent 3 suggested that *''enforcement can be improved by having active Building control agencies in different states of the country and that they can have their own byelaws to suit individual needs.''*

In the second focus group discussion, respondent 3 started the conversation by suggesting that if the government formulate policies and compel the industry, it will be followed and adhered to. He added that *''professionals cannot insist on standards if there is no firm regulatory backing.''* Respondent 5 in addition insisted that *''the government must play an active role in improving the implementation of the building code.''* He cited car use, energy targets and consumption in the United States as the example and how the government was setting targets for the automobile industry. The need for having different layers for process evaluations was stressed by respondent 2; *''There should also be checks and balances from the people the government is going to assign, to counter check initial submissions to see that what's being enacted is being followed''.* This is to indicate that improving the building code is not a

one size fits all endeavour but one that need to be improved with targets set through performance. Although both focus group discussions differ in other suggestions to improving the implementation of the building code, there was a common front in the advocacy for policies that ensure the document is adequately used. The need for these concerns to be addressed were mentioned by (Ogunbiyi, 2014).

9.3.3.4 Making drafts and summaries

Both groups agreed that making drafts, summaries and bullet points of the building code was generally agreed as the document may appear too bulky and sometimes too technical and uninteresting to read. Also, the ease of getting the document was expressed as a barrier too. The code is a general document that should specify the minimum acceptable standards for construction and as such must not bee too technical for comprehension. The availability of the document for professionals and even non professionals in the sector or general public so as to easily understand the use of the document.

9.3.3.5 Penalty on violation of the Building Code

In Lagos state, according to the focus group discussion that deals with enforcement, respondents agreed that punitive measures are effectively in place to tackle the violation of regulatory stipulations. Site shutdowns stop work orders, fines etc. are in place and monitoring is done to ensure compliance. *''Clients know that they are liable for this and they proceed at a risk''* reports respondent 4 of the focus group. This cannot be said to be generally in place for the country and further research is needed in this regard. Also, the coverage of the team might not be effective as there is a need for a more localised approach to monitoring, penalties and ensuring compliance. The focus group discussion held with professionals on site on the other hand report that there is largely no penalty for the violation of the building code and that is the reason why most clients currently operate without the following the proper guidelines. Like respondent 2 in focus group 2 opined ''*if there is a commensurate penalty for the violation of the building code, developers and clients will ensure they comply.*'' The discussion held with the on-site professionals in this regard seem to exhibit the field reality as compared with the other focus group in the enforcement department of the Building Control Agency.

9.3.4 Roles expected of stakeholders in implementing sustainable construction

Participants were asked a series of questions on the expected roles of stakeholders for the implementation of sustainable construction for industry and the responses are discussed below. The role the stakeholder improvement of sustainable construction was discussed first. Respondent 1 stated that "*clients should desire and ensure to build right*, while Respondent 2 felt that "*professionals should not encroach into other professionals' boundaries.*" Respondent 3 believed that ''*all professionals and contractors must ensure they follow due processes in the execution of their duties in practice.*'' The second focus group differed a little in their approach with respondent 5 suggesting organisational improvements through trainings, travels and exposures to more improved technology or skills then localising the knowledge acquired. Respondent 2 on the other hand believed that stakeholder

improvement for sustainable construction should target ''*continuous professional development programs towards awareness and trainings on sustainable construction with specific recommendations to the government*''.

9.3.4.1 Roles of Government in sustainable construction

Respondent 4 in focus group 1 started the discussion of the roles of the government as the regulator in by ''*advocating that all states should have an active building control agency.*'' Noting that the activities of an active building control agency will regularise some of the perceived challenges and that have been earlier discussed. The activities of the building control agencies have not really been evaluated in the Nigerian construction industry as they are new inputs only brought about by urbanisation byelaws in urban and selected peri-urban areas. Respondents 1 and 2 succintly put the central roles of government as ''*creating awareness*'' and ''*facilitating the whole process*'' respectively. While the discussions centered around policies and the roles of government, respondent 5 opined that ''*enough policies exist, however, implementation is the key and better still, the political will to implement the policies is what is lacking.*'' This indicates a lack of foundational structure within the construction industry as the industry tends to bend to the whims and caprices of the political wishes of government. While this may not look like a problem, it presents a challenge when there is a change of government, all recorded gains in one dispensation may be reversed or ignored in another tenure and this weakens the industry by derailing its direction. Respondent 3 added that ''*compromises are often observed in implementing policies from the government. So in implementing laws and policies in the industry, people with a passion to deliver and fit for the purpose must be selected.*''

Respondent 1 in the second focus group agreed that the government needs to be fully involved iin sustainable construction provision especially in funding the processes. Respondent 4 believes that '*enacting laws on waste management, construction materials environmental friendliness*' and related relevant factors is also an area where the government need to come in to salvage the existing situation of unsustainable construction patterns. He also noted that ''*nobody wants to be found on the wrong side of the law.*'' This suggests that the lack of a law or an active policy is fundamental to the existing situation. Respondent 2 while agreeing with responsent 1 on the need for financial incentives from the government such as tax rebate/ tax holidays etc, noted that since most of the sustainable materials to incorporate into the building are to be imported, ''*tax benefits will likely be needed*'' This suggests that more needs to be done at the federal, state and local levels as it relates especially to sustainable construction with regards to funding and enacting appropriate policies which is also reinforced by Ametepey *et al.,* (2015) and Chan *et al.,* (2018).

The role of the government as a regulator of the construction industry has been stressed. The need for the government to create a policy direction, awareness and facilitate processes within and outside the industry was explained here. The involvement of the government at this stage is expected to be high as

it is driving the process and the overall regulator of the industry. Funding, reducing the tax rates and import waivers on some of the materials as they will likely be imported is important to kickstart the process will be good for the implementation of sustainable construction.

9.3.4.2 The role of Government as a Client

The government exerts some power as a client as one of the prime aims of the existence of the construction industry is efficient service delivery for the client and end users. The client used to be the financier of construction and infrastructure projects before other financing initiatives became common (Li, Akintoye, Edwards and Hardcastle, 2005: OECD, 2013). However, even with modern trends such as public private partnerships, public finance initiatives etc., the role of the government as a facilitator of capital projects and public projects in the country as remarked by focus group 1 respondent 1 ''*largely relies on the government or at best getting a license from the government.*'' In most developing countries, there is a vast infrastructural gap, and this is somehow related to the lack of adequate implementation of the role of the government as a client. In some cases, the government consists of personnel who do not have deep knowledge in construction as such they employ consultants and advisers who are versed in the industry. The challenge then comes back to the industry as the existing structure cannot effectively advise its client. Respondent 4 in the same focus group discussion also explained that ''*most government projects are lacking in standard; this must be critically investigated''.*

Respondent 2 from the second focus group opined that ''*most government projects are not even being built to standard but if government can take the lead as a client, things will take shape''.* This agrees with the first focus group discussion and points to the fact that there is so much the government as the client can learn to improve its inputs to this role through implementation of standards and ensuring that such specifications and standards are adhered to. Respondent 3 also cautions that ''*in enacting laws and monitoring implementation as a regulator, government should also have other monitoring and evaluation mechanisms as a client''.* This was also pointed out by Miranda and Mirulanda (2001) and Usman and Khamidi (2012). The need for the government to actively monitor public projects sustainably and innovate using its traditional role as the client of public projects was discussed by Aniekwu (2003); Fox, Scott, and Neale (1999) and Oladinrin *et al.,* (2012).

9.3.5 The need for Strict Policies

In response to this question focus group 1 respondent 1 remarked that "*not exactly strict, as people generally do want to do the right things*,'' he was of the view that there must be ''*adequate sensitisation of the need for people to change''* before the strict policies are implemented. Respondent 4 opposed the submission and said ''*there was a policy in place, citing an instance that in the case of a lack of expected documents in Lagos, the government revokes the land*.'' Respondents 3 and 5 also corroborated the

existence of rather unclear policies by alluding to the fact with a recent building collapse incident in the area where the landowner was only charged for demolition costs after his documents were found to be legit. There is a need for clear policies and a clear evaluation and feedback mechanism as remarked by respondent 2 who opined that ''*the policies must be assessed, changed and adequately communicated from time to time*'' explaining that it may be the reason why they did not agree on the topic in the discussion.

Focus group 2 discussants opined that there is a strong need for strict policies as respondent 1 asserts that ''*if the policies are not strict, people easily go back to what they are used to. Change is hard and people are afraid to change.*'' This statement was further agreed upon by respondent 2 who added that ''*strict policies will also help in achieving the objectives of cost quality and time*''. While the first focus group discussants were not able to clearly assert the existence and activeness of regulatory policies despite being a building control agency, the second focus group on the other hand assessed the proposed impacts and possibilities of strict policies and sustainable construction practice in the area. The need for strict policies for implementing sustainable construction in developing countries was discussed by Alsanad (2015) and Pomwya and Abidin (2014).

9.3.6   Drivers identified from literature

Participants were asked some questions on the effects of other factors that may affect the sustainable construction practices identified from literature and the possible impacts of the factors on sustainable construction policies and practices in Nigeria and the responses are discussed below.

9.3.6.1 Need for synergy among stakeholders within the Nigerian construction industry

The need for effective professional teamwork, synergy, research and collaboration among professional institutions and professionals generally was assessed. Respondent 1 believed that ''*the basic synergy is there, like most times, the builders can't do much without the Architect*''. This he agreed at the project level. This is normal because according to the traditional procurement route, most times the first contacted professional likely the architect assembles the professional team for the client. However, at the professional institute or professional interaction level, he agrees ''*there should be a meeting point*'' to further other industry goals. This point is corroborated by respondent 3 in the same focus group. He further added that ''*they can also come up with white paper to advise the government on matters pertaining to the construction industry*''.

Respondents of the second focus group generally agreed that there is a need for collaboration as respondent 1 comments ''*construction is teamwork.*'' Respondent 2 agreed that ''*there is no island in knowledge and as such, it is a welcome dimension.*'' Respondent 4 relates that ''*synergy will help as even on site, some designs are truly not effective, and ordinarily all inputs are necessary for evaluation*

for more realistic designs and construction". Respondent 6 added that ''*adding newer technologies such as building information modelling (BIM) will also improve synergy, teamwork and collaboration at the project level*.'' When asked at what stage the synergy should apply, respondent 3 replied that ''*synergy matters at all levels, from the predesign stage through to the construction stage"*. The need for synergy and improved collaborative knowledge among industry practitioners especially at the industry level is necessary to ensure that new knowledge is brought in as policies and utilised to enhance standards within the industry (Adebowale *et al*., 2019).

9.3.6.2 Need for a Construction Board in the Nigerian Construction Industry

The need for a construction board comprising all stakeholders in the industry for improved collaboration, training, research, and furthering industry goals was asked in the focus group discussion. Focus group 1 respondents agreed ''*the construction industry can leverage on existing knowledge to have its own localised board for improved coordination and developments"*. The second focus group on the other hand agreed on the importance of such a board to the industry but was sceptical on the success and outputs expected. ''*Concerns were raised that existing agencies within the industry were currently not working...the question is, having a new body/ board, will it now work?''* as asked by respondent 1 of focus group 2. It was suggested within the discussion that there was a need to diagnose existing agencies saddled with these responsibilities in the Nigerian construction industry and understand why they have not delivered on their core responsibilities before embarking on new tasks of establishing the construction board to avoid a repeat pattern. The need for the construction board was highlighted when assessing the Ghanaian (Ofori, 2012) and Tanzanian (CIP, 2013) construction industries in the literature. The formulation of construction boards for knowledge and process improvements in the construction industries of developing countries have been identified as a driver for improving sustainable construction processes. However, there have not been detailed studies to evaluate their impacts and significance within the industry.

9.3.6.3 Implementation of Sustainable Construction through the local government

On the possibility of implementing sustainable construction through the local governments within the country, focus group 1 respondent 2 revealed that ''*officials of the local government sometimes work together with the state building control agency as the state is large and may not easily be coverable for the state officials alone*.'' It was reported by the Building control agency focus group that the local government officials sometimes give them information on new developments springing up in their domains and that they work together.

Asked for their opinion on the same question, the second focus group respondent 5 agreed that ''*if the local government can be empowered to implement sustainable construction, it will be more effective than the state control agencies as they have more coverage in terms of awareness, enlightenment and*

enforcement.'' Respondent 1 also added that, ''*the local governments have not been active in the performance of the duty; The local government is closer to the grassroots and it can assist more effectively.''* Challenges associated with the current situation of things were discussed and respondent 2 informed that, ''*the state offices sometimes override on some of the duties of the local government thereby making them redundant. Especially the state level building control agencies, as they have more resources than the local government''.* There is however a need to increase the capacity of the local governments, the Local Government Authority is closer to the citizenry. This idea of utilising the local government as the smallest unit of implementing sustainable construction was discussed by Tunji-Olayeni *et al.,* (2018).

9.4   Chapter Summary

This chapter has reported the outputs of two focus group interviews held with professionals working in building regulatory agencies and other practitioners in private consulting and contracting companies within the Nigerian construction industry. Their perspectives and insights on the need and possibility of formulating and actively implementing policies on sustainable construction practice and the role of concerned stakeholders in Nigeria was outlined above. This study also sought to understand the underlying reasons why the practice of sustainable construction is generally low in the country. Deeper insights that may not easily be captured by a quantitative study were revealed using qualitative studies. The next chapter reports on outputs from the quantitative study conducted in Nigeria. A triangulation study to harness and harmonise the findings of all the field studies shall be presented thereafter.

CHAPTER 10

RESULTS FROM THE QUESTIONNAIRE SURVEY

10.1   Introduction

This chapter presents results of the industry survey conducted for the purpose of validating the theoretical model developed in chapter six. Descriptive statistical analysis and corresponding reliability and validity tests were conducted. The structural equation model (SEM) was used to validate the conceptual model. The data analysis involved two stages, namely: descriptive statistical analysis and multivariate correlational data analysis which comprised of an exploratory factor analysis (EFA), confirmatory factor analysis (CFA), validation of the model and the testing of the hypotheses.

10.2 Administration of the Industry Survey

10.2.1   Questionnaire development

This phase of the study utilised a pragmatic approach wherein a structured questionnaire was developed and used to collect data from experienced construction professionals for the purpose of model validation. Questionnaires are the most popular methods of data collection (Radhakrishna, 2007). A structured questionnaire should minimise misunderstandings and misinterpretations in relation to the nature of input data required and responses obtained (Colton and Covert, 2007; Rowley, 2014).

The instrument had five sections namely Section A, B, C, D and E. Section A requested respondents to provide background information including their gender, profession, work experience, type of organisation and their level of organisational knowledge on sustainability. Section B-E focused on identified drivers for sustainable infrastructure provision in Nigeria. Two specific questions pertaining

to the respondents' opinion and experience about sustainable design stage considerations were also presented. The questions in Section B-E were closed and the rating was based on a 5-point Likert type scale where respondents were requested to provide their level of agreement by ticking a box (Ekinci, 2015).

10.2.2 Pilot study

Before administering the final industry survey, a pilot survey questionnaire was developed and reviewed by two experienced academics, who had PhD's in Construction Management and Project Management and a practicing practitioner who has a master's degree in construction management prior to the pilot testing in industry. The review was conducted to assess clarity, length, completeness, readability and overall structure of the research instrument. The feedback received from the three personnel was incorporated in the instrument before the preliminary data collection (pilot) was launched.

The pilot study was also conducted to test clarity, completeness, language and over all layout of the research instrument and to assess problems of data collection methods and strategies. The survey instrument was developed from the extensive literature review. Literature in the social sciences provide a few recommendations on sample size of a pilot study but it is indicated that sample size depends on the nature and objectives of the study (Johanson & Brooks, 2010). Hertzog (2008) recommended a sample size of 10 – 15 per group if the purpose of the pilot study is to test feasibility. Johanson & Brooks (2010) suggested 30 representative participants if the aim of the pilot study is preliminary survey or scale development. Being that the study is exploratory, ten practicing professionals in the Nigerian construction industry were electronically mailed with the pilot studies and six responses were returned within the required time frame.

The pilot survey indicated a response rate of 60% which is considered reasonable when compared to the industry norm. However, as the subsequent analysis in this research required a large sample size, data collection strategies were devised to augment the response rate. Due to the rigors envisaged it was decided to use both an internet enabled medium and drop and collect data collection techniques, as such the list collected from the professional organisations was helpful as it contained email addresses and places of work. After the pilot study was conducted, it became evident to make clearer a few of the questions such as question B4 in section B of the instrument to reduce the possibility of ambiguity in the responses of the respondents.

10.2.3 Final industry survey instrument

Following the pilot study, the final industry survey instrument was developed. Questionnaire design including the structure, layout and arrangement of questions influences the extent of respondents' engagement and response in the data collection process (Root and Blismas, 2003). To enhance the

response rate, extreme caution was applied in designing the layout of the industry survey (Lancaster, 2005). A sample of the final industry survey instrument and cover letter are enclosed in Appendix D.

10.2.4 Data collection

A list and contact details of consulting firms was obtained from the professional bodies. Potential consulting firms and public organisations were identified and professionals working in them were contacted telephonically, physically and by email to confirm their willingness to participate in the survey. Direct phone calls and personal contacts were made, and participants were reminded at least once to further enhance the response rate. The use of social media was harnessed and to this end, an electronic copy of the research instrument was made through google docs an internet enabled service and the links sent to respective respondents. This was observed to reduce the numbers of missing data as the pages only become responsive to move to the next page when all questions were filled and options selected. Hand delivery and collection of study instruments was also employed in the collection of the data. All responses were collected and collated.

As indicated in Table 10.1 a total of 380 questionnaires were sent out and 249 duly completed questionnaires were received with a response rate of 65.52%, this is considered moderately remarkable in construction management research. Percentage of completed questionnaires collected through paper survey was 25.70% and the remaining 74.30% of the responses were collected via the internet enabled service. Hair *et al.,* (2016) recommended that for factor analysis the sample size should not be less than 100 and the minimum must be 5 times the number of variables. Kline (2015) suggests 200 as a typical sample size for structural equation modelling (SEM) and according to Schumacker & Lomax (2016) smaller models with well-behaved data require at least 100 to 150 cases. The responses received in this study were considered adequate for the analysis.

Table 10.1   Response rate analysis

Response rate	Frequency	Valid Percent
E-mail/ Social media	185	74.30
Hand delivery	64	25.70
Total	249	100.0

10.3 Demographic information of the respondents

The demographic details of the respondents in the questionnaire survey are discussed below.

10.3.1 Gender

The gender composition of the respondents is shown in Table 10.2. Results show that 75.1% of the respondents were male while 24.9 were female.

Table 10.2 Gender composition

Gender	Frequency	Valid Percent (%)
Male	187	75.1
Female	62	24.9
Total	249	100.0

10.3.2 Profession of the respondents

Table 10.3 explains the professionals background of the respondents. 14.9% were architects, 14.5% were civil engineers, 48.6% were quantity surveyors while 20.5% were builders. Other professionals within the industry constituted the 1.6%.

Table 10.3   Profession of respondents

Profession	Frequency	Valid Percent
Architect	37	14.9
Civil Engineer	36	14.5
Quantity Surveyor	121	48.6
Builder	51	20.5
others	4	1.6
Total	249	100.0

10.3.3 Level of education of respondents

Table 10.4 illustrates the educational level of the respondents. Fifty five percent of the respondents had Bachelors/ Higher National Diploma (first degree/ diploma), 39.4% of the respondents have a second degree while 5.2% of the respondents had a PhD.

Table 10.4: Level of education of respondent

Level of Education	Frequency	Valid Percent
HND/Bachelors	138	55.4
Masters	98	39.4
PhD	13	5.2
Total	249	100.0

10.3.4 Type of organisation respondents work

Table 10.5 depicts the type of organisation the respondents worked at. Almost thirty three percent of the respondents worked in private consulting firms while 31.7% work in private contracting organisations, 17.3% work in public consulting firms including ministries, parastatals and agencies of the government. In public contracting organisations, 13.3% of the respondents worked there while 4.8% of the respondents worked with multi-national and expatriate firms.

Table 10.5: Type of organisation the respondent works

Type of Organisation	Frequency	Valid Percentage (%)
Private Consulting	82	32.9
Private Contracting	79	31.7
Public Consulting	43	17.3
Public Contracting	33	13.3
Multi-National Firms	12	4.8
Total	249	100.0

10.3.5 Total years of experience in the industry

Table 10.6 explains the total years of experience of the respondents. Twenty six percent of the respondents around 5 years' experience, 40.6% have around 10years experience, 19.3% have around 15 years while the rest have above 20 years cognate field experience in the construction industry.

Table 10.6: Total years of experience in the industry

Years of Industry experience	Frequency	Valid Percentage (%)
0-5 years	65	26.1
6-10 years	101	40.6
11-15 years	48	19.3
16-20 years	14	5.6
21-25 years	11	4.4
26-30 years	9	3.6
31-35 years	1	.4
Total	249	100.0

10.3.6 Years of experience in management role

Table 10.7 explains the total years of experience of the respondents in management positions. Almost seventy perent of the respondens have around 5 years' experience in management position, 24.1% have around 10 years experience, 4.0% have around 15 years while 2.0% have above 20 years cognate management experience in the construction industry.

Table 10.7: Years of experience in management role

Years in Management role	Frequency	Valid Percentage (%)
0-5 years	174	69.9
6-10 years	60	24.1
11-15 years	10	4.0
16-20 years	5	2.0
Total	249	100.0

10.3.7 Organisational concern about sustainability

Table 10.8 expressed the respondents concerns regarding sustainability operations in their organisations. Ninety two percent of the respondents revealed that there is a high concern for sustainability issues in their organisations while 7.6% assessed their organisation as low in sustainability operations.

Table 10.8: Organisational concern about sustainability

Concern about sustainability	Frequency	Valid Percentage (%)
High	230	92.4
Low	19	7.6
Total	249	100.0

10.3.8 Personal acquaintance with SC policies and strategies

Table 10.9 assessed the familiarity of the respondents with strategies associated with sustainable construction generally, 8.4% had a low knowledge, 60.6% had a moderate knowledge while 30.9% were highly familiar with strategies and policies on sustainable construction generally.

Table 10.9: Personal acquaintance with SC policies and strategies

Knowledge on SC policies	Frequency	Valid Percentage (%)

Low	21	8.4
Moderate	151	60.6
High	77	30.9
Total	249	100.0

10.3.9 Personal acquaintance on the Nigerian Building code

Table 10.10 assessed the familiarity of the respondents with the existing national building code in the construction industry, 12% had a low knowledge, 63.9% had a moderate knowledge while 24.1% were very familar with the Nigerian building code in practice.

Table 10.10: Personal acquaintance on the Nigerian Building code

Familiarity with Building code	Frequency	Valid Percentage (%)
Low	30	12.0
Moderate	159	63.9
High	60	24.1
Total	249	100.0

10.4   Improved Sustainable Construction Policy consideration factors

10.4.1 Tests for normality

Normality tests were carried out for the elements using Kolmogorov-Smirnov and Shapiro-Wilk methods. The Shapiro–Wilk test is reportedly a more appropriate method for small sample sizes (<50 samples) although it can handle a larger sample size while Kolmogorov–Smirnov test is used for $n \geq 50$ (Mishra, Pandey, Singh, Gupta, Sahu, and Keshri, 2019). For both tests, the statistic should have a high value (Max =1.0) when the fit is good and a low value (Min = 0.0) when the fit is not good. When the value of the statistic goes below 0.05, the lack of fit is significant. Researches have asserted that Shapiro-Wilk is the most powerful method to test normality of collected data when compared to existing methods (Keskin, 2006; Mendes & Pala, 2003; Razali & Wah, 2011). For both the Kolmogorov-Smirnov and Shapiro-Wilk tests, the null hypothesis states that data is collected from a normally distributed sample or population. When $P > 0.05$, the null hypothesis is accepted and data is noted as being normally distributed, however, when $P < 0.05$, the null hypothesis is rejected and the data is classified as non-normal (Mishra *et al*., 2019). The assessment of normality test is relevant in the light of decisions to take subsequently in the analyses of the data.

The Government as a regulator section, both the Shapiro-wilk and the Kolmogorov-Smirnov statistics indicate positive values (with the highest being 0.343 and 0.833 for both the Kolmogorov-Smirnov and the Shapiro- Wilk statistics respectively) as indicated in table 10.11, however, the p value is less than 0.05 thereby indicating that the data is not normally distributed, therefore the data is non normal or non parametric.

In the Government as a client section, the Shapiro-wilk and the Kolmogorov-Smirnov statistics also indicate positive values (with the highest being 0.359 and 0.842 for both the Kolmogorov-Smirnov and the Shapiro-Wilk statistics respectively) as indicated in table 10.11. The p value is less than 0.05 thereby

indicating that the data is significantly not normally distributed, therefore the data is non normal or non parametric.

In the Stakeholder's input section, the Shapiro-wilk and the Kolmogorov-Smirnov statistics reveal positive values (with the highest being 0.332 and 0.786 for both the Kolmogorov-Smirnov and the Shapiro- Wilk statistics respectively) as indicated in table 10.11. The p value is less than 0.05 thereby indicating that the data is significantly not normally distributed.

In the Agenda implementation Strategy construct section, the Shapiro-wilk and the Kolmogorov-Smirnov statistic outputs reveal positive values (with the highest being 0.341 and 0.76 for both the Kolmogorov-Smirnov and the Shapiro- Wilk statistics respectively) as shown in table 10.11. The p value is less than 0.05 thereby indicating that the data is significantly not normally distributed.

Overall, the normality statistics indicate positive outcomes of the data for both tests being significantly different from the normal distribution at 0.000 as indicated in Table 10.11. In order to account for the non-normality of the data, maximum likelihood estimation with robust standard errors and chi-square was employed.

Non-parametric analytic methods are clearly the correct choice when the assumption of normality is violated; however, they are not always the top choice for cases with small sample sizes because they have less statistical power compared to parametric techniques and difficulties in calculating the "95% confidence interval.'' (Nahm, 2016).

10.4.2 Descriptive Statistics

The mean is a measure of central tendency and used to explain the centrality of an item to the team. In a way, the mean is a single number that can estimate the value of the whole data set. The standard deviation is the summary measure of the differences of each observation from the mean.

In the government as a regulator section, the means for each observation is as represented on table 10.11. the values range between 3.93 and 4.41 relating to ''*Direct optimally the use of green bonds to mainstream construction planning and works'' and ''Ensure that building regulations work in the industry by training professionals''* respectively. The standard deviation values range from 0.899 to 1.012 and also relate to items B9 and B6 respectively.

In the Government as a Client section, the means for each observation is as represented on table 10.11. the values range between 3.87 and 4.44 relating to ''*Introduce improved initiatives and policies as against hitherto unsustainable practices through client requirements and specifications.'' and ''Ensure that qualified and informed professionals are employed on its own projects''* respectively. The standard deviation values range from 0.886 to 1.019 relating to items C9 and C6 respectively.

In the Stakeholders' Input section, the means for each observation is as represented on table 10.11. the values range between both items D2, D5 (minimum) and D8 (maximum) relating to '*Form a*

construction board for improved coordination among stakeholders within the construction industry.'' ''*Form an all-inclusive Green building council for the furtherance of SC initiatives''* and ''*Ensure Professional member's compliance with industry statutes on sustainable construction delivery.''* respectively. The standard deviation values range from 0.845 to 0.980 relating to items D8 and D2 respectively.

In the Stakeholders' Input section, the means for each observation is as represented on table 10.11. the values range between both items D2, D5 (minimum of 4.12) and D8 (maximum of 4.43) relating to ''*Form a construction board for improved coordination among stakeholders within the construction industry''*, ''*Form an all-inclusive Green building council for the furtherance of SC initiatives''* and ''*Ensure Professional member's compliance with industry statutes on sustainable construction delivery.''* respectively. The standard deviation values range from 0.845 to 0.980 relating to items D8 and D2 respectively.

In the Agenda Implementation Stratey section, the means for each observation is as represented on table 10.11. the values range between item E3 (minimum of 4.14) and E12 (maximum of 4.41) relating to ''*to utilise Local governments and municipalities in implementing SCP''* and ''*Professionals expected to monitor the process synergise effectively during the implementation to ensure success''* respectively. The standard deviation values range from 0.866 to 0.980 relating to items E12 and E4 respectively.

Overall as seen in Table 10.11, it can be seen that the item C2 ''*ensuring that qualified and informed professionals are employed own government projects''* had the highest impact with a mean value of 4.44. the table also showed that C10 ''*improving Sustainable construction initiatives and policies through client requirements and specifications''* had the least contribution with a mean value of 3.87. The standard deviation overall also indicate that D8 ''*Ensure Professional member's compliance with industry statutes on sustainable construction delivery''* has the lowest standard deviation of 0.845 while C6 ''*Lead the process by ensuring that the minimum quality standards are complied with''* has the highest value of standard deviation being 1.019.

Table 10. 11 Descriptive statistics of leading factors and tests for normality

| | | | | | Tests of Normality | | | | | |
| | | | | | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
	Government as the Regulator	N	Mean	Std. D	Statistic	df	Sig.	Statistic	df	Sig.
B1	Prepare sustainable building regulations and policies	249	4.39	.900	.307	249	.000	.658	249	.000
B2	Prepare demonstration projects for sustainable R and D	249	4.15	.907	.285	249	.000	.764	249	.000
B3	Provide participatory financial incentives for implementing SC	249	4.15	.983	.263	249	.000	.776	249	.000
B4	Direct optimally the use of green bonds to mainstream construction planning and works	249	3.93	.977	.272	249	.000	.833	249	.000

		N	Mean	Std. D	Statistic	df	Sig.	Statistic	df	Sig.
B5	Develop a strategic agenda for improved coordination in the industry	249	4.29	.919	.277	249	.000	.718	249	.000
B6	Implement research works for industry and national development	249	4.26	1.012	.289	249	.000	.715	249	.000
B7	Review extant regulations to cope with current realities in the industry.	249	4.24	.942	.269	249	.000	.724	249	.000
B8	Improve awareness within the industry and end users of industry products.	249	4.22	1.001	.286	249	.000	.714	249	.000
B9	Ensure that building regulations work in the industry by training professionals	249	4.41	.899	.343	249	.000	.677	249	.000
B10	Ensure compliance of practitioners through annual practice license validation.	249	4.25	.943	.269	249	.000	.741	249	.000
	Government as the Client	N	Mean	Std. D	Statistic	df	Sig.	Statistic	df	Sig.
C1	Ensure all its projects are done in line with SC trends.	249	4.43	.957	.353	249	.000	.620	249	.000
C2	Ensure that qualified and informed professionals are employed on its own projects	249	4.44	.962	.359	249	.000	.620	249	.000
C3	Ensure MDAs key into the strategic agenda for the growth of the industry	249	4.24	.889	.287	249	.000	.719	249	.000
C4	Ensure that all levels of government under it key into the strategic national agenda for the growth of the industry	249	4.20	.928	.283	249	.000	.748	249	.000
C5	Ensure motivations of more project offers to the team who is in tune with SCP	249	4.12	.940	.279	249	.000	.775	249	.000
C6	Lead the process by ensuring that the minimum quality standards are complied with	249	4.29	1.019	.314	249	.000	.703	249	.000
C7	Ensure that SC inputs and deliverables are enshrined from the conceptual stage to the delivery stage of project delivery	249	4.21	.991	.268	249	.000	.747	249	.000
C8	Advance SC byelaws for areas of strategic interests and cities.	249	4.22	.922	.273	249	.000	.743	249	.000
C9	Culturally integrate sustainability into client's requirements as this will promote client satisfaction and SCP	249	4.23	.866	.271	249	.000	.755	249	.000
C10	Introduce improved initiatives and policies as against hitherto unsustainable practices through client requirements and specifications.	249	3.87	.989	.248	249	.000	.842	249	.000
C11	Ensure that markets for green and sustainable products boom in the construction industry	249	4.13	.935	.299	249	.000	.746	249	.000
C12	Ensure that the approval process for construction works is harnessed and simplified.	249	4.22	.908	.265	249	.000	.755	249	.000
	Stakeholders' input	N	Mean	Std. D	Statistic	df	Sig.	Statistic	df	Sig.
D1	Facilitate industry synergy among the professionals, the contractors and the academia involved with construction in Nigeria	249	4.21	.923	.270	249	.000	.746	249	.000
D2	Form a construction board for improved coordination among stakeholders within the construction industry	249	4.12	.980	.262	249	.000	.786	249	.000
D3	Keep a database of contractor's registration and capacity improvement	249	4.24	.945	.271	249	.000	.728	249	.000
D4	Ensure the board is an all stakeholder avenue to advance knowledge on all fronts within in the industry.	249	4.19	.903	.257	249	.000	.773	249	.000
D5	Form an all-inclusive Green building council for the furtherance of SC initiatives	249	4.12	.938	.280	249	.000	.783	249	.000
D6	Harmonise all construction documents towards improved delivery of the government agenda	249	4.27	.876	.273	249	.000	.726	249	.000
D7	Improve skills development and technology incubation centres for SCP in the industry	249	4.33	.868	.280	249	.000	.711	249	.000

		N	Mean	Std. D	Statistic	df	Sig.	Statistic	df	Sig.
D8	Ensure Professional member's compliance with industry statutes on sustainable construction delivery.	249	4.43	.845	.332	249	.000	.672	249	.000
D9	Reorient the NCI towards being agenda driven not individually profit oriented.	249	4.32	.979	.315	249	.000	.703	249	.000
D10	Culturally enshrine SCP in the industry through the academics.	249	4.20	.962	.256	249	.000	.763	249	.000
D11	Bridge the gap between research and practice of sustainable construction in the industry.	249	4.25	.948	.266	249	.000	.725	249	.000
D12	Train the trainers through effective industry oriented CPD programs	249	4.32	.925	.286	249	.000	.695	249	.000
Agenda Implementation strategies		N	Mean	Std. D	Statistic	df	Sig.	Statistic	df	Sig.
E1	Stakeholders understand the strategic importance of public policy in relation to SCP	249	4.22	.976	.284	249	.000	.717	249	.000
E2	To build an integrated approach to implementing SCP	249	4.21	.909	.301	249	.000	.715	249	.000
E3	To utilise Local governments and municipalities in implementing SCP.	249	4.14	.966	.279	249	.000	.760	249	.000
E4	Local governments and municipalities are utilised for awareness of SCP	249	4.15	.980	.286	249	.000	.745	249	.000
E5	Municipalities embrace local needs and diversity in SCP	249	4.18	.907	.294	249	.000	.741	249	.000
E6	Train construction professionals on SC imperatives at the local government levels.	249	4.29	.909	.268	249	.000	.708	249	.000
E7	The monitoring of projects by the professionals at different stages as advised by the Nigerian building code	249	4.39	.949	.341	249	.000	.663	249	.000
E8	National programmes on sustainability adequately key into state/ municipal planning for construction works	249	4.27	.909	.267	249	.000	.735	249	.000
E9	At the local level, stakeholder participation and input are essential to ensure SCP legitimacy and success	249	4.24	.928	.273	249	.000	.732	249	.000
E10	The need for sustainable policy feedback, improvement and evaluation mechanisms to improve implementation in the long run.	249	4.27	.909	.263	249	.000	.721	249	.000
E11	Keep the details simple to facilitate easy understanding of SC expectations from clients and end users.	249	4.31	.910	.274	249	.000	.699	249	.000
E12	Professionals expected to monitor the process synergise effectively during the implementation to ensure success	249	4.41	.866	.308	249	.000	.651	249	.000

a. Lilliefors Significance Correction

10.5 Exploratory factor analysis

Explorative factor analysis (EFA) is used in the early stage of the analysis to explore the possibility of relationships among variables contained in the data while the confirmatory factor analysis is done thereafter to establish if the factors (data) confirms the model (Hair, Black, Babin and Anderson, 2016).

Exploratory factor analysis was used to analyse the refined conceptual model elements using the latest version of Software Package for Social Sciences (SPSS 27). The analysis included reliability, discriminant validity and convergent validity of the survey instrument. Unidimensionality of the elements was determined using factor extraction method namely Maximum likelihood with Promax Rotation. Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy were used to assess factor analysability of the data (Pallant, 2016; Tabachnick & Fidell, 2013). While KMO ranges from 0 to 1, for this research cut-off value of greater or equal to 0.7 ($p<0.05$) was

used. Eigenvalue computation was also conducted where results of eigenvalue more than 1 were considered significant. The eigenvalue of a factor signifies the extent the total variance is explained by that factor (Pallant, 2016). Multicollinearity occurs when the predictor variables are highly correlated. Multicollinearity suggests that regression coefficients may be unstable (Akinwande, Dikko and Samson, 2015). Factor loadings indicate the correlation between an original variable and its factor. In determining statistical significance of correlarion coefficients, factor loadings in the range of ±.30 to ±.40 are considered to meet the minimal level for interpretation of structure (Hair *et al*., 2016). For the purpose of this study, 0.4 is considered as the minimum loading for determining significance.

10.5.1 Analysis of the drivers

10.5.1.1 Government as a Regulator

In determining the extent of the item correlation under this construct, the KMO was 0.938 while the Bartlett's test of sphericity was achieved with a significance of ($p< 0.00$) as shown in table 10.12. These tests confirmed that the data could be factor analysed and that the construct attained discriminant validity. In this subscale, inter correlation values <0.90 thereby indicating no that there is no evidence of multicollinearity in the sub scale.

Table 10.12   Factorability of the Government as a Regulator

Items	KMO	Bartlett's test of Sphericity		
		Approx. Chi-square	(df)	Sig. (p)
10	0.938	1996.423	45	.000

Communalities reflect the variance in each item and can be used to refine or modify a scale. Low communality values indicate a poor fit with other items in the subscale therefore removing the item may increase the total variance (Pallant, 2016). Communalities of 0.999 or equal to 1 are excessively high and may come in bold as a warning as it is generally accepted in the social and behavioural sciences that no single item should reflect more than 90% of true variance. Table 10.13 shows the communalities for the construct government as a regulator, indicating that all the values are within acceptable range. Factor loadings of all the variables also were above the recommended 0.40 (Hair *et al*., 2014). One eigenvalue above 1.0 was established for this construct explaining 68% of the variance in the data as indicated in table 10.14. Adequate evidence of convergent and discriminant validity was provided for this unidimensional construct.

Table 10.13 Factor loadings for government as a regulator driver

Item	Element	Factor loading	Corrected item-total correlation	Communalities	
				Initial	Extraction
B1	Prepare sustainable building regulations and policies	.757	.744	.673	.573
B2	Prepare demonstration projects for sustainable research and development	.735	.728	.663	.540
B3	Provide participatory financial incentives for implementing SC	.782	.764	.597	.612

B4	Direct optimally the use of green bonds to construction works	.755	.736	.597	.571
B5	Develop a strategic agenda for improved coordination in the industry	.823	.801	.650	.678
B6	Implement research works for industry and national development	.810	.782	.637	.656
B7	Review extant regulations to cope with current realities in the industry.	.857	.825	.734	.735
B8.	Improve awareness within the industry and end users of industry products.	.849	.821	.713	.721
B9	Ensure building regulations work in the industry by training professionals	.848	.814	.715	.719
B10	Ensure compliance of practitioners through license validation.	.812	.785	.649	.659

Table 10.14 Variances for the government as a regulator driver

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.816	68.160	68.160	6.462	64.620	64.620
2	.653	6.532	74.692			
3	.505	5.053	79.745			
4	.434	4.339	84.084			
5	.354	3.537	87.621			
6	.326	3.262	90.883			
7	.287	2.867	93.749			
8	.259	2.590	96.339			
9	.199	1.987	98.326			
10	.167	1.674	100.000			
Extraction Method: Maximum Likelihood.						

10.5.1.2   Government as a Client

In determining the extent of the item correlation under this construct, the KMO was 0.955 while the Bartlett's test of sphericity was achieved with a significance of ($p< 0.00$) as shown in table 10.15. These tests confirmed that the data could be factor analysed and that the construct attained discriminant validity.

Table 10.15 Assessing the factorability of the government as a client driver

Items	KMO	Bartlett's test of Sphericity		
		Approx. Chi-square	(df)	Sig. (p)
12	0.955	2583.546	66	.000

Table 10.16 shows the communalities for the construct government as a client under analysis, indicating that all the values are within acceptable range. Factor loadings of all the variables were above the recommended 0.40. A primary factor above 8.0 was established for this construct explaining about 68% of the variance in the data as shown in table 10.17. Adequate evidence of convergent and discriminant validity was provided for this unidimensional construct.

Table 10.16 Factor loadings of the government as a client driver

Item	Element	Factor loading	Corrected item-total correlation	Communalities Initial	Communalities Extraction
C1	Ensure all its projects are done in line with SC trends.	.803	.777	.727	.645
C2	Ensure that qualified and informed professionals are employed on its own projects	.855	.838	.783	.731
C3	Ensure MDAs key into the strategic agenda for the growth of the industry	.853	.829	.724	.728
C4	Ensure all levels of government under it key into the strategic national agenda for the growth of the industry	.872	.850	.753	.761
C5	Ensure motivations of more project offers to the team who is in tune with SCP	.770	.742	.596	.592
C6	Lead the process by ensuring that the minimum quality standards are complied with	.677	.668	.544	.458
C7	Ensure SC inputs through all stages of project delivery	.780	.772	.661	.609
C8	Advance SC byelaws for areas of strategic interests and cities.	.828	.800	.700	.686
C9	Culturally integrate sustainability into client's requirements to promote client satisfaction and SCP	.853	.832	.739	.727
C10	Introduce improved policies through client requirements and specifications.	.723	.706	.541	.522
C11	Ensure that markets for green and sustainable products boom in the construction industry	.819	.802	.671	.671
C12	Ensure the approval process for construction works is harnessed and simplified.	.820	.803	.658	.672

Table 10.17 Variance of the government as a client driver

		Total Variance Explained				
		Initial Eigenvalues			Extraction Sums of Squared Loadings	
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.143	67.854	67.854	7.803	65.027	65.027
2	.694	5.785	73.639			
3	.624	5.203	78.843			
4	.443	3.694	82.536			
5	.378	3.149	85.685			
6	.335	2.796	88.481			
7	.312	2.598	91.079			
8	.299	2.489	93.569			
9	.236	1.969	95.538			
10	.204	1.697	97.235			
11	.179	1.493	98.728			
12	.153	1.272	100.000			
Extraction Method: Maximum Likelihood.						

10.5.1.3   Stakeholders Input

In determining the extent of the item correlation under this construct, the KMO was 0.954 while the Bartlett's test of sphericity was achieved with a significance of (p< 0.00) as shown in table 10.18. These tests confirmed that the data could be factor analysed and that the construct attained discriminant validity.

Table 10.18   Factorability of the stakeholder input driver

Items	KMO	Bartlett's test of Sphericity		
		Approx. Chi-square	(df)	Sig. (p)

12	0.954	2693.998	66	.000

Table 10.19 shows the communalities for the construct stakeholder input under analysis, indicating that all the values are within acceptable range. Factor loadings of all the variables also were above the recommended 0.40. A primary factor above 8.0 was established for this construct explaining 70% of the variance in the data as shown in table 10.20. Adequate evidence of convergent and discriminant validity was provided for this unidimensional construct.

Table 10.19   **Factor loadings of the stakeholders' input driver**

Item	Element	Factor loading	Corrected item-total correlation	Communalities Initial	Communalities Extraction
D1	Facilitate industry synergy among all stakeholders involved with construction	.847	.833	.732	.717
D2	Form a construction board for improved coordination within the industry	.774	.760	.630	.599
D3	Keep a database of contractor's registration and capacity improvement	.819	.805	.661	.671
D4	Ensure the board is an all stakeholder avenue to advance knowledge on all fronts within the industry.	.757	.745	.602	.573
D5	Form an all-inclusive Green building council for the furtherance of SC initiatives	.784	.770	.662	.615
D6	Harmonise all construction documents towards improved delivery of the government agenda	.861	.838	.747	.741
D7	Improve skills development and technology incubation centres for SCP in the industry	.846	.823	.716	.716
D8	Ensure Professional member's compliance with industry statutes on sustainable delivery.	.840	.820	.729	.705
D9	Reorient the NCI towards being agenda driven not individually profit oriented.	.797	.783	.674	.635
D10	Culturally enshrine SCP in the industry through the academics.	.815	.796	.671	.664
D11	Bridge the gap between research and practice of sustainable construction in the industry.	.857	.833	.763	.735
D12	Train the trainers through effective industry oriented CPD programs	.843	.824	.721	.710

Table 10.20   **Variance of the Stakeholders' input driver**

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.408	70.063	70.063	8.083	67.355	67.355
2	.542	4.518	74.581			
3	.518	4.318	78.899			
4	.424	3.537	82.437			
5	.405	3.375	85.812			
6	.349	2.912	88.724			
7	.314	2.618	91.342			
8	.275	2.290	93.631			
9	.228	1.897	95.528			
10	.217	1.808	97.336			
11	.165	1.374	98.710			
12	.155	1.290	100.000			
Extraction Method: Maximum Likelihood.						

10.5.1.4 Agenda implementation strategies

In determining the extent of the item correlation under this construct, the KMO was 0.960 while the Bartlett's test of sphericity was achieved with a significance of (p< 0.00) as shown in table 10.21. These tests confirmed that the data could be factor analysed and that the construct attained discriminant validity.

Table 10.21   Factorability of the Agenda implementation strategy driver

Items	KMO	Bartlett's test of Sphericity		
		Approx. Chi-square	(df)	Sig. (p)
12	0.960	2969.424	66	.000

Table 10.22 shows the communalities for the construct stakeholder input under analysis, indicating that all the values are within acceptable range. Factor loadings of all the variables also were above the recommended 0.40. A primary factor above 8.0 was also established for this construct explaining 73% of the variance in the data as shown in table 10.23. Adequate evidence of convergent and discriminant validity was provided for this unidimensional construct.

Table 10.22   Factor loadings of the Agenda implementation strategy driver

Item	Element	Factor loading	Corrected item-total correlation	Communalities	
				Initial	Extraction
E1	Stakeholders understand the strategic importance of public policy in relation to SCP	.837	.818	.740	.701
E2	To build an integrated approach to implementing SCP	.876	.859	.795	.767
E3	To utilise Local governments and municipalities in implementing SCP.	.838	.822	.741	.703
E4	Local governments and municipalities are utilised for awareness of SCP	.834	.819	.748	.696
E5	Municipalities embrace local needs and diversity in SCP	.832	.818	.713	.692
E6	Train construction professionals on SC imperatives at the local government levels.	.835	.819	.691	.697
E7	The monitoring of projects by the professionals at different stages as advised by the Nigerian building code	.810	.795	.664	.656
E8	National programmes on sustainability adequately key into state/ municipal planning for construction works	.810	.798	.692	.656
E9	At the local level, stakeholder participation and input are essential to ensure SCP legitimacy and success	.817	.804	.683	.668
E10	The need for sustainable policy feedback, improvement and evaluation mechanisms to improve implementation in the long run.	.854	.838	.756	.729
E11	Keep the details simple to facilitate easy understanding of SC expectations from clients and end users.	.862	.844	.748	.742
E12	Professionals expected to monitor the process synergise effectively during the implementation to ensure success	.854	.837	.730	.730

Extraction Method: Maximum Likelihood.

Table 10.23   **Variance of the Agenda implementation driver**

	Total Variance Explained					
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.732	72.769	72.769	8.436	70.300	70.300
2	.632	5.270	78.039			
3	.444	3.701	81.740			
4	.360	2.997	84.737			
5	.319	2.658	87.395			
6	.306	2.548	89.943			
7	.252	2.097	92.040			
8	.237	1.979	94.019			
9	.222	1.849	95.868			
10	.192	1.600	97.467			
11	.171	1.427	98.895			
12	.133	1.105	100.000			
Extraction Method: Maximum Likelihood.						

10.6   Correlations

The relationships that exist between different variables can be measured by conducting correlation analysis. While there are different methods to preform correlation analysis, this research employed Pearson correlation analysis method. Correlation values range between -1 to +1. While the direction is indicated by the sign, the strength of the correlation is indicated by the value of the number. Pallant (2016) agrees that correlation values should be >0.30 to show relevance.

Table 10.24 presents the correlation analysis results between variables composed in the first construct Government as a regulator. Correlation values between the ten items were high and therefore, convergent validity was confirmed. The factors are related to each other. The correlations range from 0.518 to 0.772 for B1:B4 and B7:B9 being the lowest and the highest. They are above the cut off point of 0.30. Correlations below 0.90 are indicative of discriminant validity. The construct therefore satisfied both internal reliability and discriminant validity as the Cronbach's alpha was above the recommended 0.70. Convergent validity is noticed to be satisfied as well as high correlation values, statistical significance and the positive sign of parameter coefficients were satisfactory.

Table 10.24 Correlations for Government as a regulator

	Correlations									
	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
B1	1.000									
B2	0.742	1.000								
B3	0.632	0.589	1.000							
B4	0.518	0.604	0.645	1.000						
B5	0.662	0.623	0.643	0.630	1.000					
B6	0.579	0.567	0.610	0.610	0.663	1.000				
B7	0.611	0.550	0.679	0.690	0.713	0.681	1.000			
B8	0.587	0.652	0.644	0.639	0.667	0.696	0.743	1.000		
B9	0.656	0.551	0.648	0.581	0.703	0.702	0.772	.0722	1.000	
B10	0.589	0.582	0.613	0.589	0.650	0.713	0.666	0.733	0.698	1.000

The correlation values in table 10.25 indicate that the items were related, and the highest correlations were between 0.454 and 0.831 that is C6:C5 and C2:C1 respectively. Discriminant validity was also achieved as correlations were below 0.90. Internal reliability and construct validity conditions were also satisfied.

Table 10.25 Correlations for Government as a client

						Correlations						
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
C1	1.000											
C2	.831	1.000										
C3	.732	.761	1.000									
C4	.667	.726	.773	1.000								
C5	.599	.658	.692	.721	1.000							
C6	.572	.630	.561	.561	.454	1.000						
C7	.591	.672	.631	.691	.582	.680	1.000					
C8	.636	.659	.716	.750	.619	.506	.592	1.000				
C9	.639	.698	.686	.737	.653	.527	.704	.760	1.000			
C10	.491	.557	.587	.657	.556	.495	.588	.629	.643	1.000		
C11	.652	.667	.669	.686	.628	.539	.622	.719	.735	.643	1.000	
C12	.643	.695	.673	.696	.606	.589	.643	.675	.732	.612	.703	1.000

The correlation values in table 10.26 explain that the items were correlated, and the highest correlations are noticed between 0.579 and 0.785 that is D10:D4 and D11:12 respectively. Discriminant validity was also achieved as correlations were below 0.90. Internal reliability and construct validity conditions were also satisfied.

Table 10.26 Correlations for stakeholder's inputs

						Correlations						
	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
D1	1.000											
D2	.752	1.000										
D3	.714	.669	1.000									
D4	.659	.617	.655	1.000								
D5	.618	.571	.663	.677	1.000							
D6	.704	.624	.716	.640	.721	1.000						
D7	.691	.641	.666	.601	.660	.761	1.000					
D8	.691	.619	.688	.660	.621	.755	.766	1.000				
D9	.654	.611	.653	.584	.686	.644	.680	.707	1.000			
D10	.717	.646	.653	.579	.590	.665	.672	.704	.678	1.000		
D11	.750	.639	.665	.627	.645	.758	.743	.684	.621	.741	1.000	
D12	.696	.642	.681	.613	.675	.720	.698	.663	.715	.690	.785	1.000

The correlation values in table 10.27 indicate that the items were very related, and the highest correlations are between 0.620 and 0.834 that is E7:E4 and E2:E1 respectively. Discriminant validity

was also achieved as correlations were below 0.90. Internal reliability and construct validity conditions were also satisfied.

Table 10.27 Correlations for Agenda implementation strategies

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12
						Correlations						
E1	1.000											
E2	0.834	1.000										
E3	0.691	0.757	1.000									
E4	0.707	0.720	0.800	1.000								
E5	0.694	0.732	0.754	0.786	1.000							
E6	0.721	0.747	0.681	0.707	.721	1.000						
E7	0.669	0.689	0.649	0.620	.640	.669	1.000					
E8	0.625	0.663	0.647	0.637	.651	.678	.723	1.000				
E9	0.677	0.685	0.638	0.633	.658	.683	.698	.750	1.000			
E10	0.666	0.707	0.725	0.691	.675	.668	.704	.751	.731	1.000		
E11	0.696	0.740	0.709	.684	.696	.688	.713	.704	.724	.811	1.000	
E12	0.706	0.757	0.666	.706	.673	.739	.727	.690	.696	.742	.756	1.000

10.7   Data reduction redundancy and re-checks for multicollinearity

The exploratory factor analysis sections checked for multicollinearity through the communalities in the earlier sections and it was seen that there was no defined communality in the range of 0.90, According to Hair *et al.* (2016), it became necessary to check for data redundancy through variance inflation factors (VIF) and tolerance (T). Thresholds of 4.0 and 0.2 respectively indicate some elements of collinearity to reduce the effects of suppressor variables (Akinwande, Dikko and Samson, 2015).

Items B7 and B8 were found to exhibit variance factors with consistently average higher outcomes after five iterations their factors tended towards the thresholds of 4.0 as such, they were excluded from further analysis. Items C2, C4 and C9 were also found to exhibit unusually high average collinearity outcomes after five iterations their factors beyond the thresholds of 4.0. In fact, C2 had average of 4.5. as such, C2, C4 and C9 were excluded from the confirmatory analysis.

Items D6, D8 and D11 were found to exhibit variance inflation factors VIFs of higher outcomes after five iterations their factors tended towards the thresholds of 4.0 and they were excluded from further analysis. Items E2, E4 and E10 displayed variance inflation factors VIFs of higher digits after iterations their factors tended towards the thresholds of 4.0 and were excluded from further analysis.

10.8   Reliability analysis

Reliability refers to the degree which responses are free from random measurement error (Kline, 2016). Reliability analysis was conducted on the unidimensional scales as it assumes all scales are unidimensional. The reliability of the scales in this study was assessed for internal consistency with the use of the Cronbach's alpha. Cronbach's alpha measures the degree to which responses are consistent

across items within a scale or single measure. The Cronbach's alpha coefficient for an acceptable cut off is 0.70, which was what was used (Leedy and Omrod, 2013; Tabachnick and Fidel, 2013) .

Table 10.28. Reliability for the drivers

Sub scales	Number of items	Cronbach's Alpha
Government as a Regulator	8	0.931
Government as a client	9	0.934
Stakeholders' input	9	0.945
Agenda Implementation Strategies	9	0.952

Table 10.28 indicates that the subscales exceed the minimum Cronbach's alpha specification of 0.70. the agenda implementation strategy driver had the highest Cronbach's alpha coefficient of 0.952. This indicates an acceptable internal reliability of the drivers.

To further explore and assess the reliability of the drivers, corrected item-total correlation and Cronbach's alpha if item were deleted was examined. The corrected item-total correlation is expected to be greater than the suggested value of 0.30 (Fields, 2012; Pallant, 2016). Lower values indicate that the item measures a different phenomenon from the entire construct as a whole and it is not in tandem.

Table 10.29 Item-total correlation for the identified drivers

	Subscales	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Govt As a Regulator	Prepare sustainable building regulations and policies	.755	.922
	Prepare demonstration projects for sustainable research and development	.733	.924
	Provide participatory financial incentives for implementing SC	.758	.922
	Direct optimally the use of green bonds to construction works	.719	.925
	Develop a strategic agenda for improved coordination in the industry	.795	.919
	Implement research works for industry and national development	.770	.921
	Ensure building regulations work in the industry by training professionals	.790	.920
	Ensure compliance of practitioners through license validation.	.769	.921
Govt As a Client	Ensure its own projects are done in line with SC trends.	.753	.926
	Ensure MDAs key into the strategic agenda for the growth of the industry	.814	.923
	Ensure motivations of more project offers to the team who is in tune with SCP	.722	.928
	Lead the process by ensuring that quality standards are followed	.668	.932
	Ensure SC inputs through all stages of project delivery	.759	.926
	Advance SC byelaws for areas of strategic interests and cities.	.783	.924
	Introduce improved policies through client requirements and specifications.	.700	.930
	Ensure that markets for green and sustainable products boom in the industry	.799	.924
	Ensure the approval process for construction works is harnessed and simplified.	.794	.924
Stake holder's inputs	Facilitate industry synergy among all stakeholders involved with construction	.827	.936
	Form a construction board for improved coordination within the industry	.767	.940
	Keep a database of contractor's registration and capacity improvement	.801	.938

	Ensure the board is an all stakeholder avenue to advance knowledge on all fronts within the industry.	.740	.941
	Form an all-inclusive Green building council for the furtherance of SC initiatives	.765	.940
	Improve skills development and technology incubation centres for SCP in the industry	.794	.938
	Reorient the NCI towards being agenda driven not individually profit oriented.	.786	.939
	Culturally enshrine SCP in the industry through the academics.	.780	.939
	Train the trainers through effective industry oriented CPD programs	.811	.937
Agenda Impleme-ntation Strategy	Stakeholders understand the strategic importance of public policy in relation to SCP	.801	.947
	To utilise Local governments and municipalities in implementing SCP.	.794	.948
	Municipalities embrace local needs and diversity in SCP	.803	.947
	Train construction professionals on SC imperatives at the local government levels.	.817	.946
	The monitoring of projects by the professionals at different stages	.801	.947
	National programmes on sustainability adequately key into state/ municipal planning for construction works	.798	.947
	At the local level, stakeholder participation and input are essential to ensure SCP legitimacy and success	.807	.947
	Keep the details simple to facilitate easy understanding of SC expectations from clients and end users.	.834	.946
	Professionals expected to monitor the process synergise effectively during the implementation to ensure success	.829	.946

10.9 The Structural Equation Modelling

Structural Equation Modelling (SEM) provides a quantitative test of a hypothesized theoretical model (Schumacker & Lomax, 2016). It has two basic components namely measurement model and structural model (Hair, *et al.,* 2016). The measurement model specifies how latent variables are measured in terms of observed variables while the structural model expresses relationships among latent variables (Byrne, 2016; Leedy and Ormrod, 2016). The subsequent sections present how SEM was used for validation of the theoretical model developed in this research.

10.9.1 Confirmatory Factor Analysis (CFA)

In the preceding sections of this chapter unidimensionality and reliability of the constructs were assessed using exploratory factor analysis and enough evidence was demonstrated. The EFA analysis was followed by confirmatory factor analysis using Analysis of Moment Structures (AMOS) version 27. The analysis employed maximum likelihood robust estimator to analyse the construct validity of the measurement models.

CFA provides information on the individual variables and fit indices in order to assess how well the survey data fits the proposed conceptual model. The fits that exist in structural equation modelling are classified as absolute, incremental and parsimonious fits (Hooper, Coughlan and Muller, 2008). The absolute model fit indices explains how well a proposed model fits the data and in this category, there is the root mean square error of approximation (RMSEA), chi-squared tests, the adjusted goodness of fit index (AGFI), the goodness of fit index (GFI), the standardised root mean square residual (SRMR) and the root mean squared residual (RMR).

Incremental fit indices are also known as relative or comparative fix indices do not consider the chi-square in its evaluation but rather compare the chi-square value to a base line model. The normed fit index (NFI), comparative fit index (CFI), and the non normed fixed index (NNFI) also known as the Tucker Lewis index (TLI) are examples of the incremental fit indices. Parsimonious fit indices test the complexity of the model, they are mostly based on adjusting the degrees of freedom of some comparative fit indices. However, there are currently no generally accepted thresholds for the interpretation of the model, however, a degree above 0.50 is considered acceptable for now.

The following fit indices considered in this research: satorra bentler chi-square, root-mean-square-error of approximation (RMSEA), comparative fit index (CFI), tucker-lewis index (TLI) and the standardised root mean square residual (SRMR). Model fit cut-off criteria used in this research are indicated in Table 10.30.

Table 10.30 Model fit criteria for the confirmatory factor analysis

Model fit criterion	Symbol/ Criterion	Acceptable threshold levels	Interpretation	Source/ Reference
Chi square	X^2	Low relative *df* with an insignificant *p*- value (*p*>0.05)		(Schumacker & Lomax, 2016)
Chi square/ degree of freedom	X^2/df or CMIN	Ratio of (X^2) to *df ≤2 or 3* Ratio of (X^2) to *df ≤ 5*	*good fit* *acceptable*	(Hair *et al.*, 2016; Kline, 2016; Schumacker & Lomax, 2016)
Root mean square error of approximation (RMSEA)	RMSEA	< 0.05 > 0.06 to 0.08 > 0.08 to 1.00 > 1.00	"good fit" "acceptable fit". "Mediocre fit" "poor fit"	(Hair *et al.*, 2016; Kline, 2016; Schumacker & Lomax, 2016)
Comparative fit index (CFI)	CFI	≥0.95 ≥ 0.90	"good fit" "acceptable fit"	(Hair *et al.*, 2016; Kline, 2016; Schumacker & Lomax, 2016)
Tucker-Lewis index (TLI)	TLI	>0.95 ≥ 0.90	good fit "acceptable fit"	(Hair *et al.*, 2016; Kline, 2016; Schumacker & Lomax, 2016)
Standardised root mean square residual (SRMR)	SRMR	≤0.05 ≤ 0.08	"good fit" "acceptable fit"	(Hair *et al.*, 2016; Kline, 2016; Schumacker & Lomax, 2016)

10.9.2 Government as a Regulator sub measurement model

In this section, the confirmatory analysis for the government as a regulator latent variable is presented. The standardised factor loadings of the observed variables ranged from 0.74 to 0.83 as shown in figure 10.1. The factors are all statistically significant. The result indicated convergent validity. There were no cross loadings and as such, the standardised factor loadings were interpreted as the correlations between the observed variables and the constructs it loaded on to.
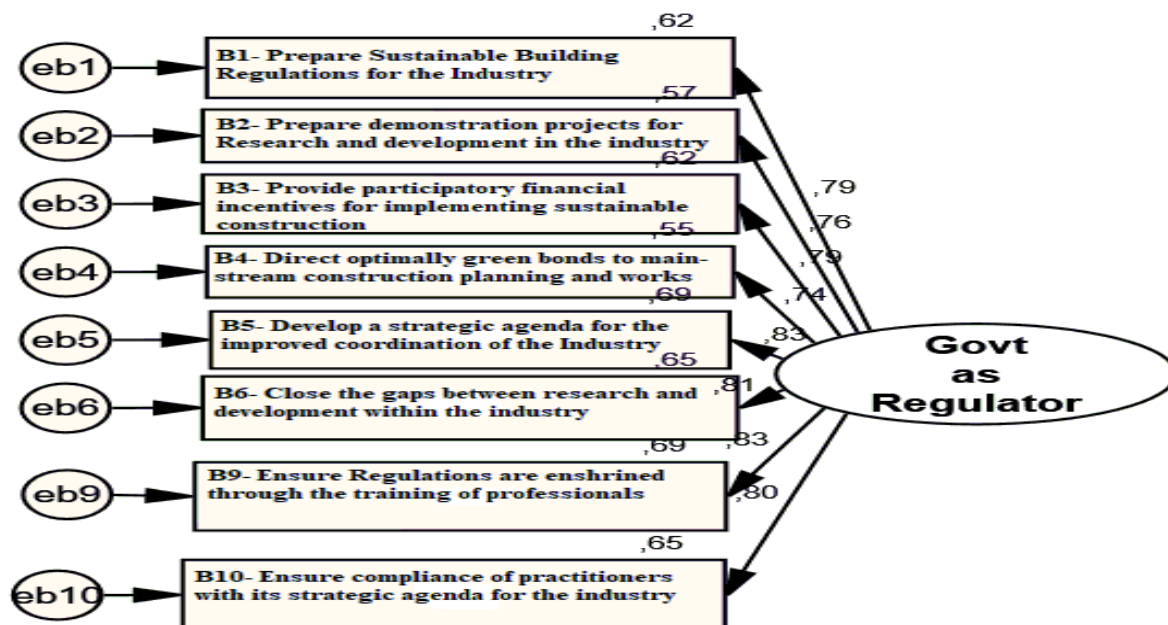
Legend: eb1, eb2, eb3, eb4, eb5, eb6, eb9, eb10- error terms, **B1- B10 Variables, Govt as Regulator (Factor)**
Figure 10.1 Measurement model for Government as a regulator construct

As indicated in Table 10.31, correlation matrices calculated for the construct shows that all inter-correlations were < 0.90, implying that there was no multicollinearity. This result concluded that the construct attained discriminant validity. The results also indicated that the construct is adequately measured by its observable variables and that these variables are good indictors of the latent variable.

Table 10.31 Government as a regulator sub model correlation

	B10	B1	B2	B3	B4	B5	B6	B9
B10	1.000							
B1	.589	1.000						
B2	.582	.742	1.000					
B3	.613	.632	.589	1.000				
B4	.589	.518	.604	.645	1.000			
B5	.650	.662	.623	.643	.630	1.000		
B6	.713	.579	.567	.610	.610	.663	1.000	
B9	.698	.656	.551	.648	.581	.703	.702	1.000

Legend: **B1**; Prepare sustainable building regulations, **B2**; Prepare demonstration projects for R+D, **B3**: Provide financial incentives, **B4**; Direct the use of green bonds to mainstream construction, **B5**: Develop a strategy for improved coordination, **B6**: close the gap between research and the industry, **B9**: Culturally enshrine regulations through training, **B10**: Ensuring compliance of professionals through license validation.

Validity of the CFA model was assessed using several tests and the results are presented in Table 10.32. The chi square value found to be significant with a p-value of < 0.05 showing inconsistency with adequate fit. The normed chi-square value was < 5.00 indicating acceptable fit. As the sample size of the study is large and since the chi square value is sensitive to samples size, other indices were considered for the assessment.

Table 10.32 Government as a Regulator Measurement model indicators

Indices	X2	df	X2/df	P-Value	RMSEA	CFI	TLI	SRMR
Model	95.623	20	4.781	0.000	0.123	0.945	0.923	0.0390

			Acceptable	mediocre	mediocre	Acceptable	Acceptable	Acceptable
Model Re-specification	31.080	17	1.828	0.020	0.058	0.990	0.983	0.0221
			Good fit	acceptable	Good fit	Good fit	Good fit	Good fit

The value of RMSEA was between 0.08 and 1.0 with p- value of 0.000, indicating "mediocre fit" approximation of the model. The indices show that the current model provided poor to acceptable fit to the data. To improve the fit of the model, model re-specification was carried out.
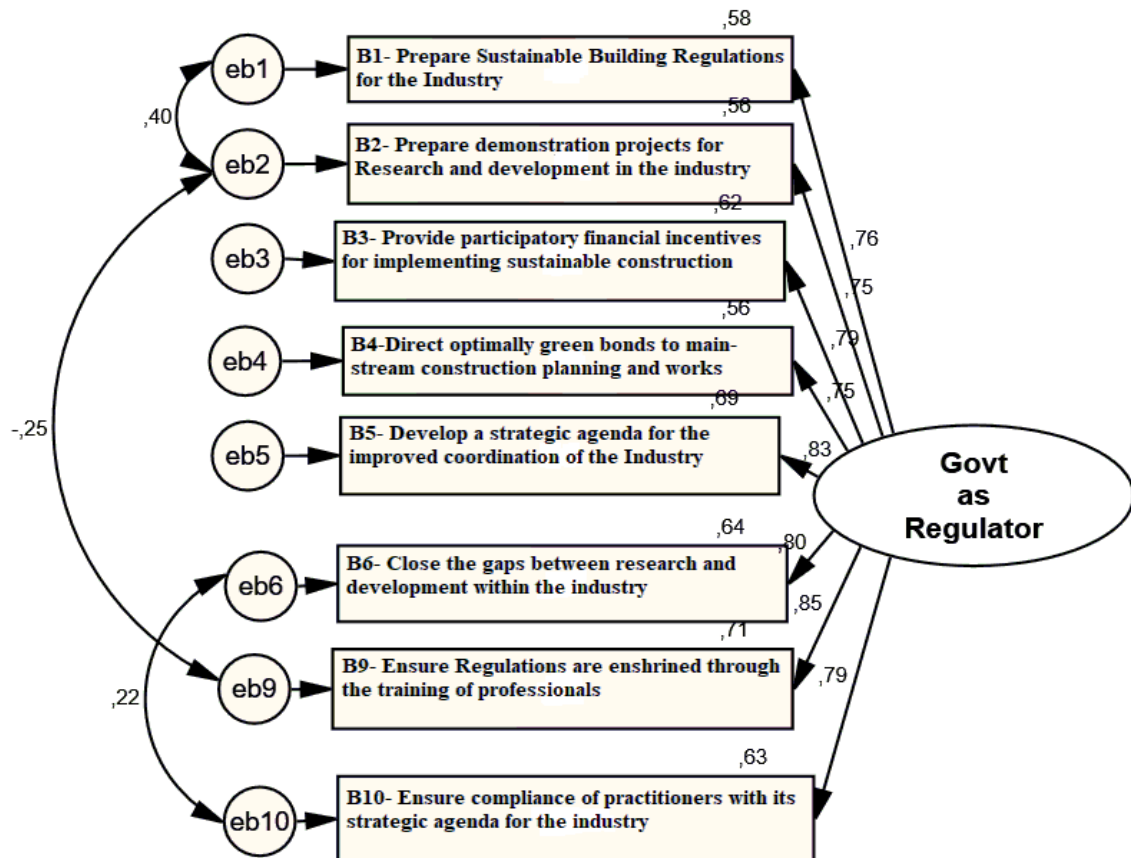
Legend: eb1, eb2, eb3, eb4, eb5, eb6, eb9, eb10- error terms, **B1- B10 Variables, Govt as Regulator (Factor)**

Figure 10.2 Modified measurement model for Government as a regulator construct

The model re-specification was conducted according to the modification indices (MI) provided by the AMOS program. Indicator metrics with the highest residual correlation were identified and error terms within the factor were correlated. The first correlation was introduced between items "*ensuring building*

regulations are enshrined through the training of professionals" and "*preparing demonstration projects for sustainable research and development in the construction industry*". The second correlation was introduced between items "*closing the gap between research and construction developments*" and "*ensuring compliance of practitioners through annual practice license validation*". A third correlation was introduced between items ''*preparing sustainable building regulations for the industry*'' and "*preparing demonstration projects for sustainable research and development within the industry*". The model was tested after it was modified, and the results are shown in figure 10. 2 and table 10.31. The results showed that convergent and discriminant validity and that the items adequately measured the latent variable. The model fit indices showed that the specified model provided an acceptable fit to the data.**10.9.3   Government as a client sub measurement model**

In this section, the confirmatory analysis for the government as a client latent variable is presented. The standardised factor loadings of the observed variables ranged from 0.69 to 0.85 as shown in figure 10.3. The factors are all statistically significant. The result indicated convergent validity. There was no cross loadings and as such, the standardised factor loadings were interpreted as the correlations between the observed variables and the constructs it loaded on to.

Legend: er1, er3, er5, er6, er7, er8, er10, er11, er12- error terms, **C1**; **C12** Variables, **GAC** – Government as Client (Factor)

Figure 10.3 Measurement model for Government as a client construct

Table 10.32 indicates correlation matrices calculated for the construct shows that all inter-correlations were < 0.90, implying that there was no multicollinearity. This result concludes that the construct

attained discriminant validity. The results also indicate that the construct is adequately measured by its observable variables and that these variables are good indictors of the latent variable.

Table 10.33 Correlation matrix for the sub measurement model

	C1	C3	C5	C6	C7	C8	C10	C11	C12
C1	1.000								
C3	.669	1.000							
C5	.599	.643	1.000						
C6	.542	.581	.520	1.000					
C7	.609	.653	.584	.528	1.000				
C8	.650	.697	.624	.564	.634	1.000			
C10	.575	.617	.552	.499	.561	.599	1.000		
C11	.657	.705	.631	.570	.641	.684	.605	1.000	
C12	.650	.697	.624	.564	.634	.677	.599	.684	1.000

C1; Ensure government projects are done through SC, **C3**; Ensure all departments key in, **C5**: Motivate performers with other projects, **C6**; ensure compliance with   minimum quality standards, **C7**: Ensure SC trends go through the project lifecycle, C8: advance SC byelaws for cities, **C10**: promote SC initiatives through client requirements and specifications, **C11:** Ensure market boom for SC, **C12** ensure the approval process is simplified.

Validity of the CFA model was assessed using several tests and the results are presented in Table 10.33. The chi square value found to be significant with a p-value of < 0.05 showing inconsistency with adequate fit. The normed chi-square value was < 5.00 indicating acceptable fit. As the sample size of the study is large and since the chi square value is sensitive to samples size, other indices were considered for the assessment.

Table 10.34 Government as a client measurement model indicators

Indices	X2	df	X2/df	P-Value	RMSEA	CFI	TLI	SRMR
Model	86.406	27	3.20	0.000	0.094	0.962	0.949	0.0361
			Acceptable	mediocre	mediocre	Acceptable	Acceptable	Acceptable
Model Re-specification	33.317	24	1.388	0.098	0.040	0.994	0.991	0.0212
			Good fit	acceptable	Good fit	Good fit	Good fit	Good fit

The value of RMSEA was between 0.08 and 1.0 with p-value of 0.000, indicating "mediocre fit" approximation of the model. The indices show that the current model provided poor to acceptable fit to the data. To improve the fit of the model, model re-specification was carried out.
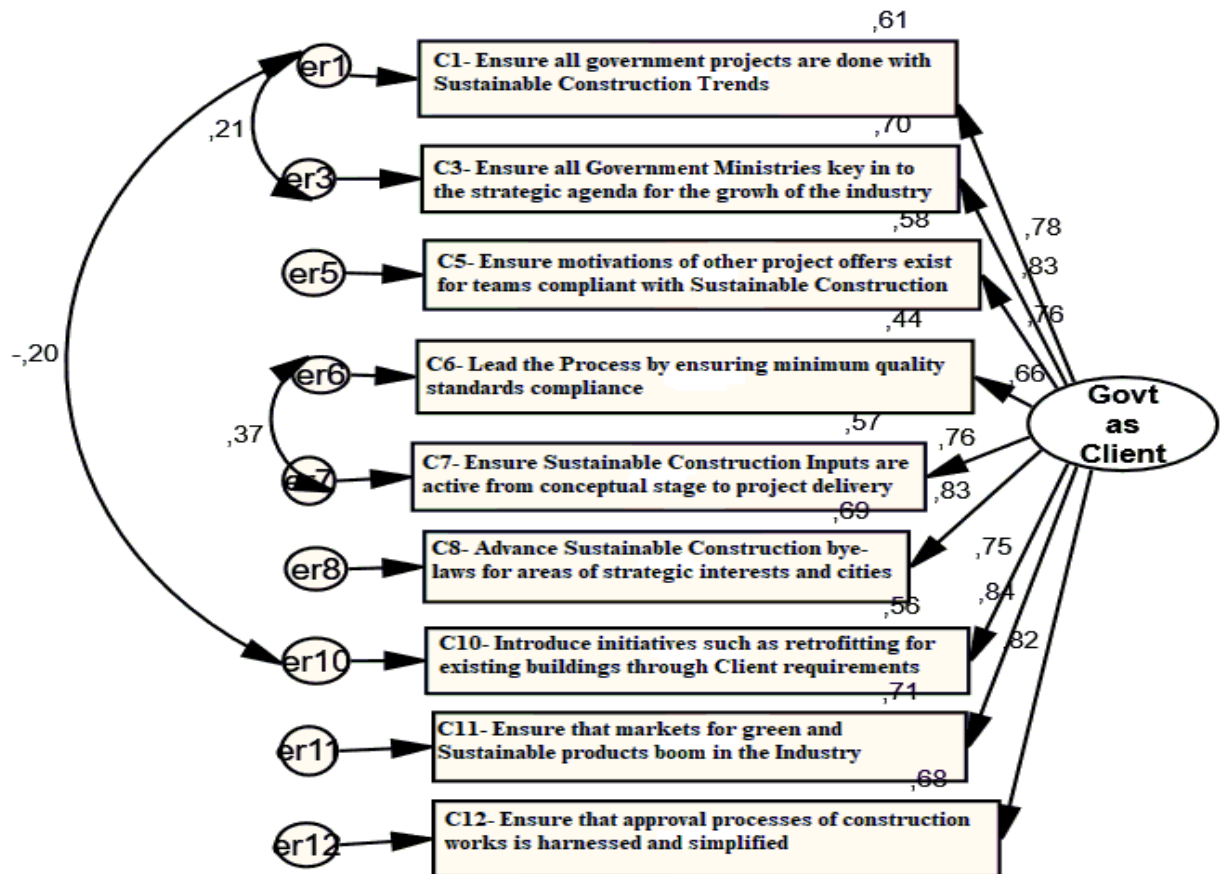
Legend: **er1, er3, er5, er6, er7, er8, er10, er11, er12**- error terms, **C1- C12** Variables,
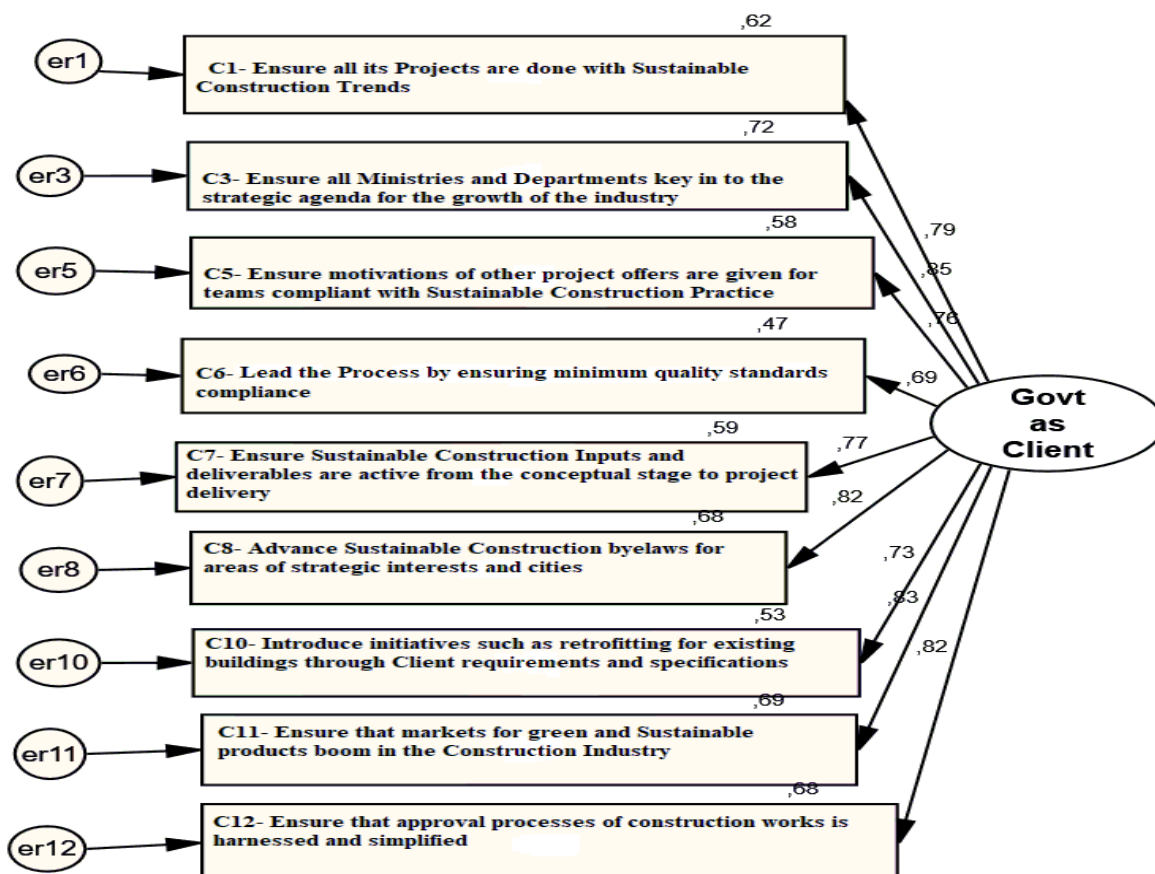
GAC – Government as Client (Factor/ Construct)

Figure 10.4 Modified measurement model for Government as a Client construct

The model re-specification was addressed according to the modification indices (MI) provided by the program. Indicator metrics with the highest residual correlation were identified and error terms within the factor was correlated. The first correlation was introduced between items "*ensuring SC trends go through the project lifecycle*" and "*ensuring compliance with minimum standards*". The second correlation was introduced between items "*promoting SC initiatives through clients requirements and specifications*" and "*ensuring government projects are done through sustainable construction*". A third correlation was introduced between items ''*ensuring all departments under government keep in*'' and ''*ensuring government projects are done through sustainable construction*''. The model was tested after it was modified, and the results are satisfactory as shown in Figure 10.4 and Table 10.33. The results showed that convergent and discriminant validity and that the items adequately measured the latent variable. The model fit indices showed that the specified model provided an acceptable fit to the data.

10.9.4 Stakeholders Input sub measurement model

In this section, the confirmatory analysis for the input of the stakeholder latent variable is presented. The standardised factor loadings of the observed variables ranged from 0.76 to 0.85 as shown in figure 10.5. The factors are all statistically significant. The result indicated convergent validity. As there were no cross loadings, the standardised factor loadings were interpreted as the correlations between the observed variables and the constructs it loaded on to.

Legend: **er1, er2, er3, er4, er5, er6, er7, er8, er9**- error terms, **D1-** D12 Variables, **SI** – Stakeholders input (Factor)

Figure 10.5 Measurement model for Stakeholders input construct

Table 10.34 indicates correlation matrices calculated for the construct shows that all inter-correlations were < 0.90, implying that there was no multicollinearity. This result concludes that the construct attained discriminant validity. The results also indicate that the construct is adequately measured by the observable variables and that these variables are good indictors of the latent variable.

Table 10.35 Correlation matrices for the stakeholder input sub model

	D1	D2	D3	D4	D5	D7	D9	D10	D12
D1	1.000								
D2	.678	1.000							
D3	.704	.657	1.000						
D4	.649	.605	.629	1.000					
D5	.670	.625	.649	.598	1.000				
D7	.699	.652	.677	.624	.644	1.000			
D9	.691	.645	.670	.617	.637	.665	1.000		
D10	.690	.644	.668	.616	.636	.663	.656	1.000	
D12	.714	.666	.692	.637	.658	.686	.679	.677	1.000

Legend:D1; Facilitating industry synergy, **D2**; Forming a construction board, **D3**: Database of contractors and capacity, **D4**; advancing industrial knowledge and coordination in the board, **D5**: All-inclusive Green building council, **D7**; Skills development and technology incubation for SC, **D9**: Orientation towards being agenda driven, **D10:** Ensure SCP through academics, **D12** Training trainers through

Validity of the CFA model was assessed using several tests and the results are presented in Table 10.35. The chi square value found to be significant with a p-value of < 0.05 showing inconsistency with adequate fit. The normed chi-square value was < 5.00 indicating acceptable fit. As the sample size of the study is large and since the chi square value is sensitive to samples size, other indices were considered for the assessment.

Table 10.36   Model indicators of the stakeholders' input submodel

Indices	X2	df	X2/df	P-Value	RMSEA	CFI	TLI	SRMR
Model	65.993	27	2.444	0.000	0.076	0.977	0.970	0.0278
			Acceptable	mediocre	mediocre	Acceptable	Acceptable	Acceptable
Model Re-specification	33.365	24	1.390	0.097	0.040	0.995	0.992	0.0203
			Good fit	acceptable	Good fit	Good fit	Good fit	Good fit

The value of RMSEA was between 0.08 and 1.0 with p-value of 0.000, indicating "mediocre fit" approximation of the model. The indices show that the current model provided poor to acceptable fit to the data. To improve the fit of the model, model re-specification was carried out.

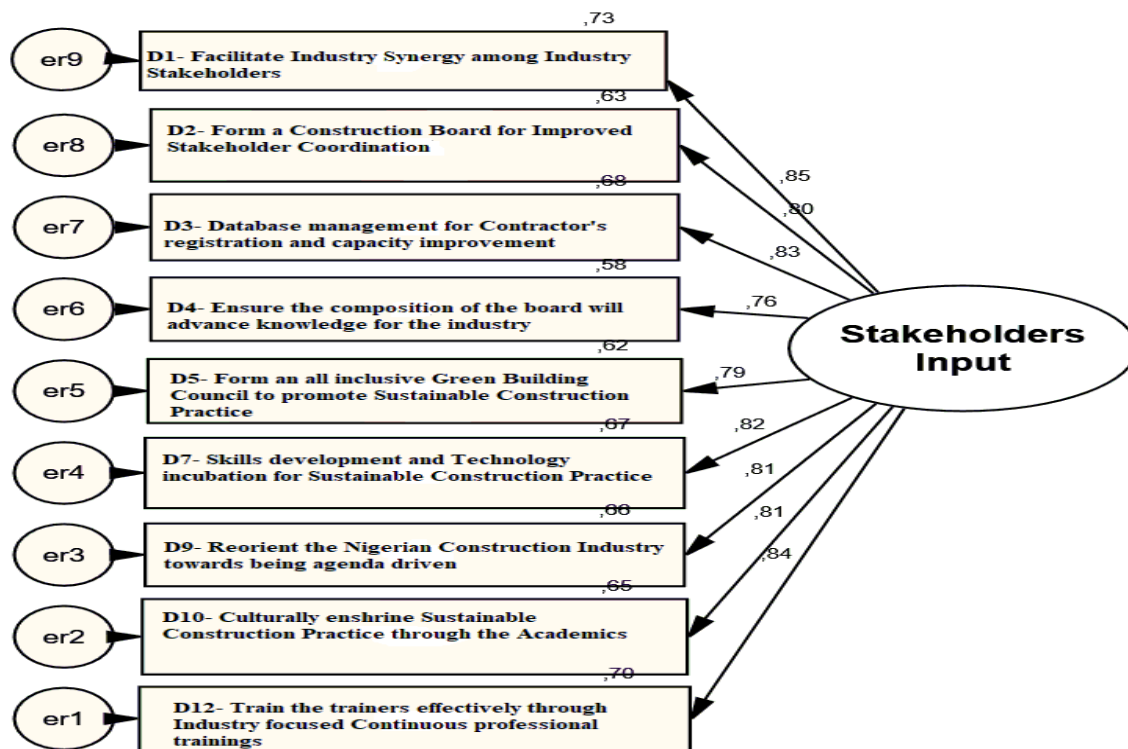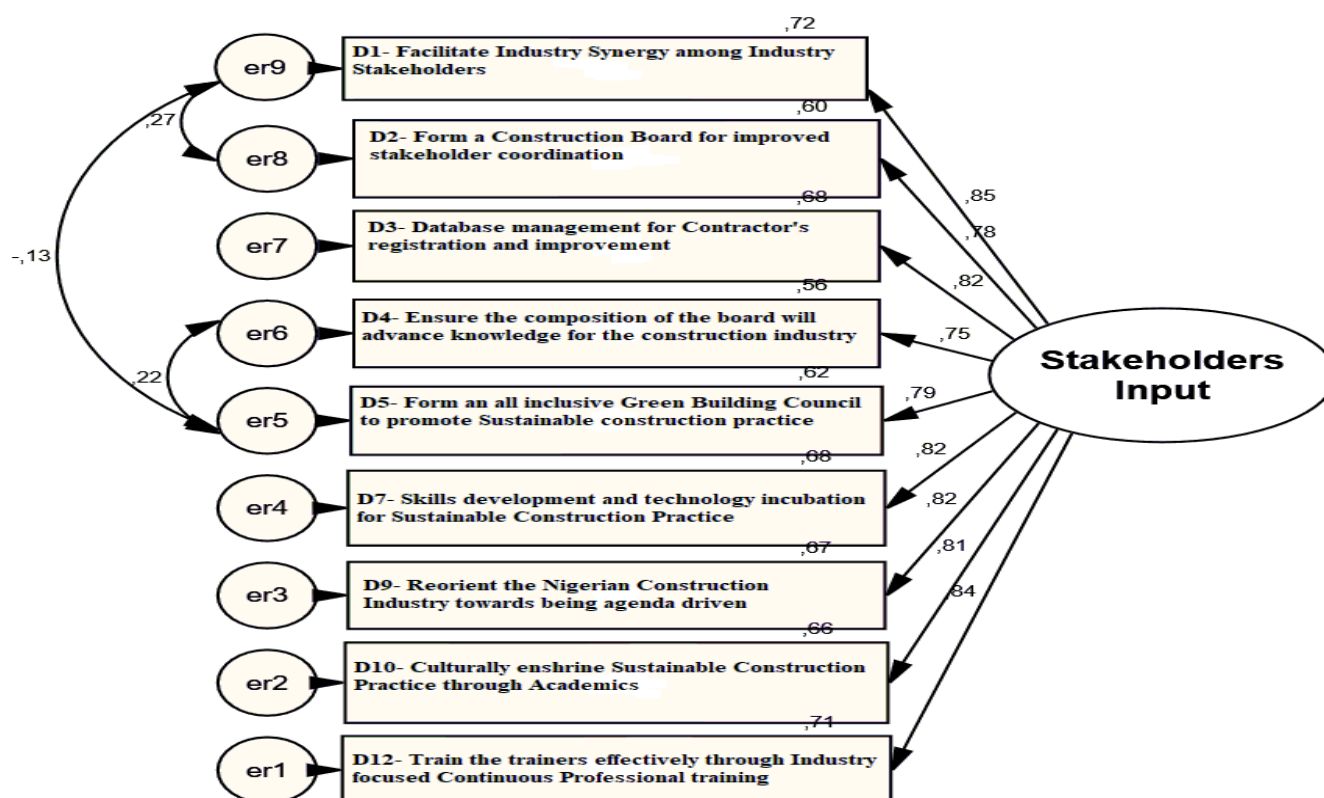**Legend: er1, er2, er3, er4, er5, er6, er7, er8, er9**- error terms, **D1**- D12 (Variables) **SI** – Stakeholders input (Factor)

Figure 10.6 Modified measurement model for Stakeholder Input construct

The model re-specification was addressed through the modification indices (MI) provided by the programme. Indicator metrics with the highest residual correlation were identified and error terms within the factor were correlated. The first correlation was introduced between items "*facilitating industry synergy*" and "*creating an all-inclusive green building council*". The second correlation of error terms was introduced between items "*facilitating industry synergy*" and "*forming a construction board.*" A third correlation was introduced between items ''*advancing industry knowledge and coordination of the board*'' and ''*creating an all-inclusive green building council*''. The model was tested after it was modified, and the results are shown in Figure 10. 6 and Table 10. 35. The results showed that convergent and discriminant validity and that the items adequately measured the latent variable. The model fit indices showed that the specified model provided an acceptable fit to the data.

10.9.5 Agenda implementation strategy sub measurement model

The confirmatory factor analysis for the input of the stakeholder latent variable is presented. The standardised factor loadings of the observed variables ranged from 0.76 to 0.85 as shown in figure 10.5. The factors are all statistically significant. The result indicated convergent validity. As there were no cross loadings, the standardised factor loadings were interpreted as the correlations between the observed variables and the constructs it loaded on to.

Legend: e13, e14, e15, e16, e17, e18, e19, e20, e21- error terms, **E1-E12** (Variables), **AIS** – Agenda Implementation Strategy (Factor/ Construct).

Figure 10.7 Measurement model for Agenda implementation strategy construct

Table 10.37 below, indicates correlation matrices calculated for the construct shows that all inter-correlations were < 0.90, implying that there was no multicollinearity. This result concludes that the construct attained discriminant validity. The results also indicate that the construct is adequately measured by the observable variables and that these variables are good indictors of the latent variable.

Table 10.37 Correlations of the Agenda implementation strategies sub model

	E1	E3	E5	E6	E7	E8	E9	E11	E12
E1	1.000								
E3	.670	1.000							
E5	.676	.669	1.000						
E6	.690	.683	.689	1.000					
E7	.678	.671	.678	.692	1.000				
E8	.675	.668	.674	.688	.677	1.000			
E9	.683	.675	.682	.696	.684	.681	1.000		
E11	.706	.699	.705	.720	.708	.704	.712	1.000	
E12	.703	.695	.702	.717	.705	.701	.709	.733	1.000

Legend**E1**; Stakeholders understand the importance of public policy in relation to SC, **E3**; Utilising local governments and municipalities in implementing SC, **E5**: Municipalities embrace local needs and diversity in SC practice, **E6**; Training staff at the municipal levels, **E7**: Professionals monitoring at different stages of the project lifecycle **E8**: National programmes keying into state and local government/ municipality programmes, **E9**: Input at local levels essential to ensure SC policy legitimacy and success E**11:** Keep the details simple to enhance easy understanding of SC expectations, **E12** Professionals synergise effectively during policy implementation

Validity of the CFA model was assessed using several tests and the results are presented in Table 10.38. The chi square value was found to be significant with a p-value of < 0.05 showing inconsistency with adequate fit. The normed chi-square value was < 5.00 indicating acceptable fit. As the sample size of the study is large and since the chi square value is sensitive to samples size, other indices were considered for the assessment.

Table 10.38 Model indicators for the AIS submodel

Indices	X2	df	X2/df	P-Value	RMSEA	CFI	TLI	SRMR
Model	70.935	27	2.627	0.000	0.081	0.977	0.969	0.0260
			Acceptable	mediocre	mediocre	Acceptable	Acceptable	Acceptable
Model Re-specification	30.85	24	1.285	0.158	0.034	0.996	0.995	0.0171
			Good fit	acceptable	Good fit	Good fit	Good fit	Good fit

The value of RMSEA was between 0.08 and 1.0 with p- value of 0.000, indicating "mediocre fit" approximation of the model. The indices show that the current model provided poor to acceptable fit to the data. To improve the fit of the model, model re-specification was carried out.
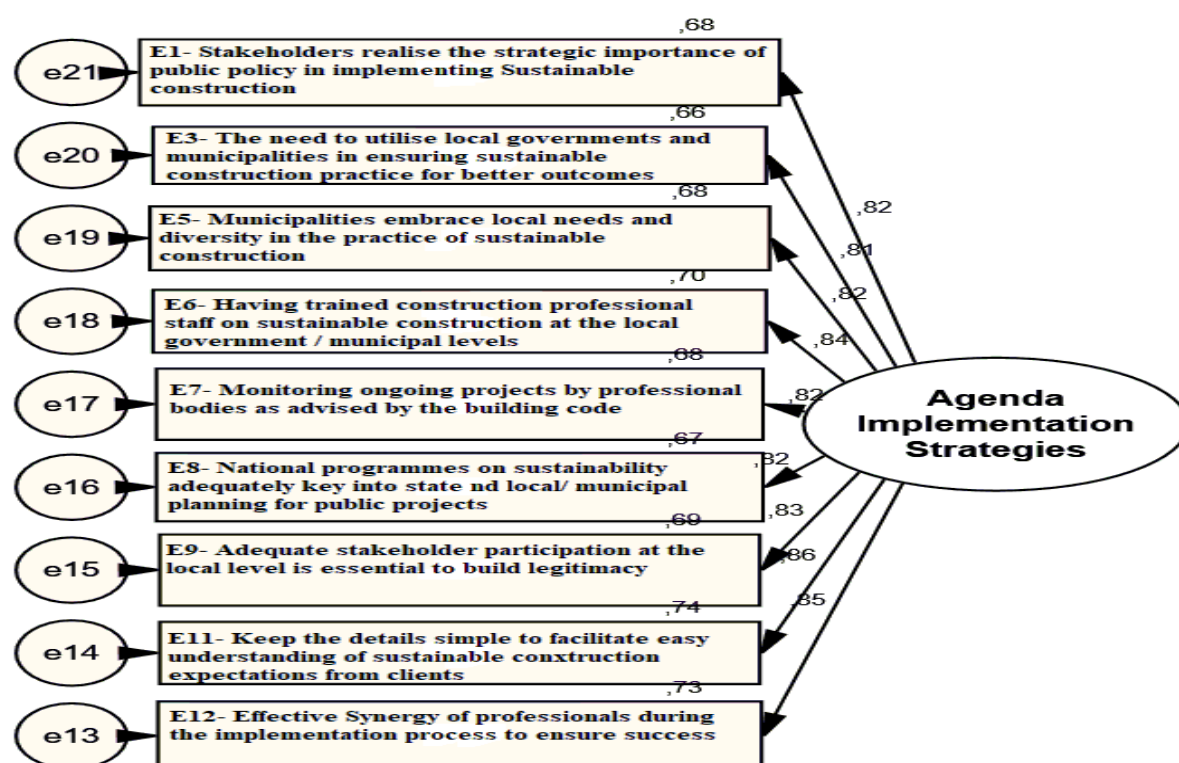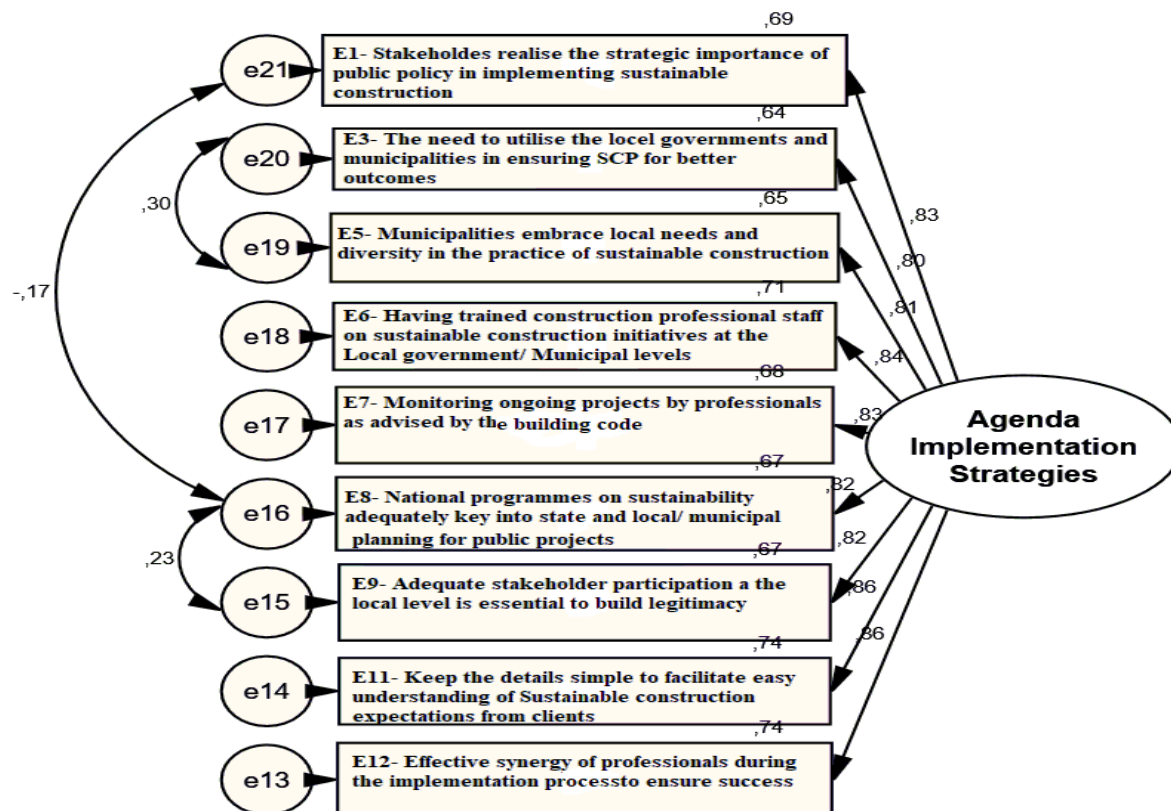
Legend: e13, e14, e15, e16, e17, e18, e19, e20, e21- error terms, **E1-E12** (Variables), **AIS** – Agenda Implementation Strategy (Factor/ Construct).

Figure 10.8 Modified measurement model for Agenda Implementation strategy construct

The model re-specification was addressed through the modification indices (MI) provided by the program. Indicator metrics with the highest residual correlation were identified and error terms within the factor were correlated. The first correlation was introduced between items "*facilitating industry synergy*" and "*creating an all-inclusive green building council*". The second correlation of error terms was introduced between items "*facilitating industry synergy*" and "*forming a construction board*". A third correlation was introduced between items ''*advancing industry knowledge and coordination of the board*'' and ''*creating an all-inclusive green building council*''. The model was tested after it was modified, and the results are shown in Figure 10.8 and Table 10. 37. The results showed that convergent and discriminant validity was achieved and that the items adequately measured the latent variable. The model fit indices showed that the specified model provided an acceptable fit to the data.

10.9.6 Statistical Parameters of the Model

In evaluating the parameters of a CFA model, reliablity and viability is further assessed aside from the fits of the structural model. Average variance extracted and the composite reliability of the extracted factors were assessed. The average variance extracted (AVE) is a measure of the variance extracted by

a construct in relation to its amount of variance due to measurement error. It is generally assessed to be a measure to assess convergent validity (Schumaker and Lomax, 2016). The AVE for each construct is obtainable by sum of squares of completely standardised factor loadings divided by this sum plus total of error variances for indicators as shown in the formulae in equation 10.1 below. An AVE of 0.5 is acceptable while for the convergent validity as it explains the loading of the variables on the construct (Hair *et al.,* 2016). In the same vein the composite reliability measures the internal consistency of the scales and is more preferable to cronbach's alpha in CFA models (Garson, 2019). The formulae utilised in calculating the composite reliability estimates is as represented in equation 10.2. The minimum threshold for composite reliability in CFA is 0.60 (Overby and Suvanujasiri, 2012). An inspection of our parameters as depicted on table 10.39 indicate that conditions for construct reliability was satisfied being that none of the factor loadings was exceptionally low below the threshold of 0.3. Convergent validity was also established as the AVE was relatively above the minimum threshold of 0.50. Composite reliability of the CFA outputs were also satisfied as they were above the minimum threshold of 0.60.

$$AVE = \sum_{i=1}^{n} \lambda_1^2$$

$$CR = \frac{(\sum \lambda_1)^2}{(\sum \lambda_1)^2 + (\sum \varepsilon_i)}$$

Equation 10.1 Average Variance extracted

Equation 10.2 Composite Reliability

Where n = number of items on a scale

Where n = number of items on a scale

λ = standardised factor loadings

λ = standardised factor loadings

ε = errors

Table 10.39: CFA Parameters for the CFA model

Construct	Label	Factor Loading	AVE	CR
Government as a	B1	0,76		
Regulator	B2	0,75		
	B3	0,79		
	B4	0,75	0,6253	0,930187
	B5	0,83		
	B6	0,80		
	B9	0,85		
	B10	0,79		
Government as a Client	C1	0,78		
	C3	0,83		
	C5	0,76		
	C6	0,66		
	C7	0,76	0,6131	0,934172
	C8	0,83		
	C10	0,75		
	C11	0,84		
	C12	0,82		
Stakeholders' inputs	D1	0,85		
	D2	0,78		
	D3	0,82		
	D4	0,75		
	D5	0,79	0,6551	0,944679

	D7	0,82		
	D9	0,82		
	D10	0,81		
	D12	0,84		
Agenda Implementation	E1	0,82		
Strategies	E3	0,80		
	E5	0,81		
	E6	0,84		
	E7	0,83	**0,6893**	**0,952276**
	E8	0,82		
	E9	0,82		
	E11	0,86		
	E12	0,86		

10.10   Resolution of the Second Order Factor Model

The previous sections addressed the factor analysis and the fit of the observed variables and their corresponding factors (latent variables). Measurement models were also evaluated and the fit indices evaluated, where there was a need to modify the initial model, model respecification was done to ensure fit. In this section, the complete second order model was developed and tested to measure how the data collected through the questionnaire survey fits into the hypothesized conceptual model. To start with, the correlations among latent factors (measurement models) were assessed. Pictorial representation of this correlations are indicated as the initial structural model presented in Figure 10.9. The correlations exhibited are above 0.8 thereby indicative of lack of adequate discriminant validity. Where the latent factors exhibit moderate correlations, this solution of a final structural model would have been appropriate (Koufteros, Babbar and Kaighobadi 2009). However, this initial solution (of factor correlation only) is not applicable in this case, as theoretically, the study is aimed at checking the effects of the factors in improving sustainable construction practice and not to understand the relationships between the factors, a second order factor was introduced to also to make the hypotheses testable.
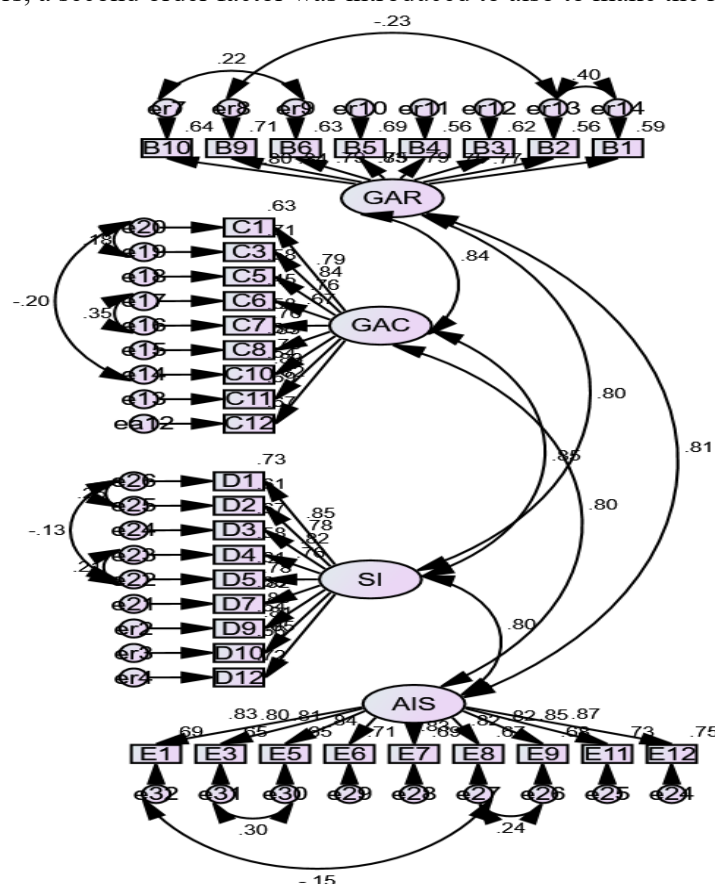
Legend: e24-e32, er7-er14, ea12-e20, er4-er26 –error items**, r1-r4-** residual items**, GAR, GAC, SI, AIS-**First order CFA components indicating correlations

Figure 10.9 Model indicating correlation of latent factors

Table 10.40 Correlation among first order components

Correlation	Estimates
GAR ←→GAC	0.836 (0.84)
GAR ←→ AIS	0.798 (0.80)
GAR ←→ SI	0.813 (0.81)
GAC ←→ AIS	0.799 (0.80)
GAC ←→ SI	0.826 (0.83)
AIS ←→ SI	0.798 (0.80)

Legend: GAR- Government as a Regulator, **GAC-** Government as a Client, **SI-**Stakeholders' Input, **AIS-**Agenda Implementation strategy

The conceptual model had four intervening and one dependent latent variable. While the intervening variables had measuring variables or indicators as shown in figure 10.10, the dependent latent variable, namely, improved sustainable construction practice (ISCP) could not be measured and did not have measuring variables. In order to measure the dependent variable, a second order factor analysis was conducted. A second order factor model is indicated when first-order factors are explained by some higher order factor structure (Schumacker & Lomax, 2016). In this instance the dependent latent variable was considered as a second-order factor and the four intervening variables were considered as first order factors. In second-order factor analysis, second-order factors are measured indirectly through the indicators of the first-order factors (Kline, 2016). In structural equation modelling, a variable with an arrow pointed at it is known as a dependent variable and such will maintain the status of being dependent throughout. A variable will only operate as a dependent or independent variable but not as both in an equation. With higher order variables, the first order variables are conceptualised as dependent variables (Byrne, 2016: p 149). This also supposes that the variances and covariances are presumed to be accounted for by the higher order factor. Initially, confirmatory factor analysis was executed for the first-order constructs to ensure that the underlying first-order components were mutually exclusive. Results of the analysis (Table 10. 39) indicated that the correlations between the components was below the threshold of 0.90. This indicated the non-existence of redundancy among the components measuring the improved sustainable construction practice (ISCP) variable. Subsequently, goodness of fit indices of the second order factor model was examined to test if the data fitted the conceptual model perfectly. Results of the analysis were tabulated in Table 10.41
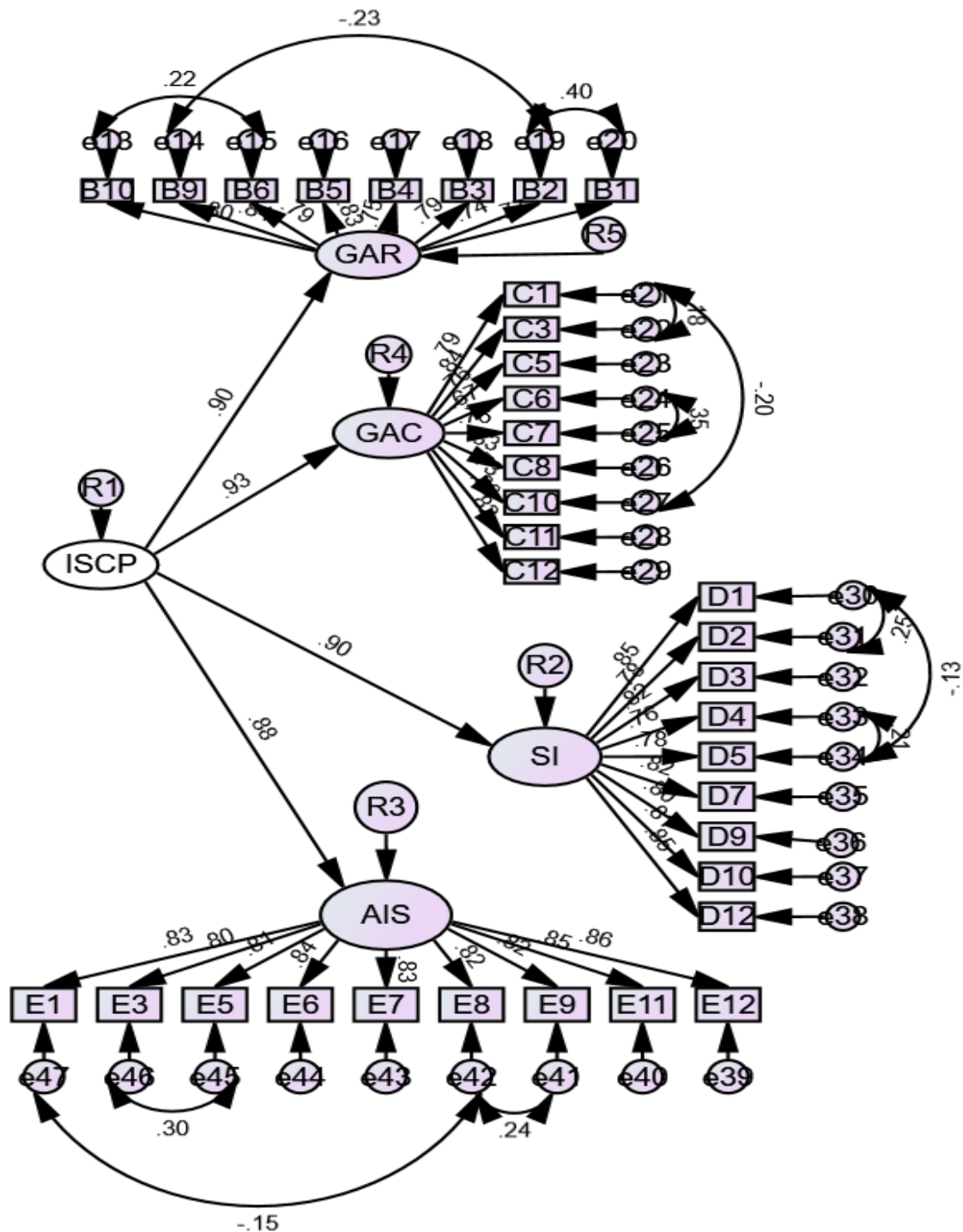
Legend: e24-e32, er7-er14, ea12-e20, er4-er26 –error items, **r1-r4**- residual items, **GAR, GAC, SI, AIS**-First order CFA components, **ISCP**—Second order CFA component

Figure 10.9 Fully hypothesised measurement model

The structural model fit indices are as indicated in table 10.39 , the chi square was significant at p<0.005. the normed chi square is < 3.0 indicating good fit of the model. The RMSEA was at 0.065 indicating

good fit as well. The comparative fit index (CFI) and Tucker Lewis Index (TLI) are 0.929, 0.922 respectively indicating an acceptable fit threshold. The standard root mean residual (SRMR) was 0.0383 indicating a good fit.

Table 10.41 Second Order factor model fit indices

Indices	X^2	df	X^2/df	P-Value	RMSEA	CFI	TLI	SRMR
Structural Model	1105.625	544	2.032 Good fit	0.000 Good fit	0.065 Good fit	0.929 Acceptable	0.922 Acceptable	0.0383 Good fit

10.10.1 Modification of the second order factor model

The aim of the second order factor model was to check how the variables fit to the model and as it fits with the theoretical model, as such, the structural model was not modified or re specified. This model confirms the importance of the identified primary factors to the improvement of the second order factor.

10.11   Model fit and hypothesis testing

Fig 10.9 shows the hypothesised relationships between the first and second order factors (dependent and independent variables) specified in the structural model. Four hypothesised relationships identified in the model are identified below:

H1: A positive relationship is predicted between *government's role as the regulator* and *improved sustainable construction practice.*

H2: A positive relationship exists between *government's role as a client* and *improved sustainable construction practice.*

H3: A positive relationship exists between the *input of stakeholders* and *improved sustainable construction practice.*

H4: A positive relationship exists between the *strategies for sustainable agenda implementation* and *improved sustainable construction practice*.

Table 10.42   Standardised factor loadings and P-value of the second order factor model

Hypothesis	Standardised factor loading	P-Value	Status of hypothesis
H1: A positive relationship is predicted between *government's role as the regulator* and *improved sustainable construction practice.*	0.90	0.000	Not rejected
H2: A positive relationship is predicted between *government's role as a client* and *improved sustainable construction practice.*	0.93	0.000	Not rejected
H3: A positive relationship is predicted between the *input of stakeholders* and *improved sustainable construction practice*.	0.90	0.000	Not rejected
H4: A positive relationship exists between the *strategies for agenda implementation* and *improved sustainable construction practice*.	0.88	0.000	Not rejected

As indicated in table 10.42, all the hypothesised relationships were significant and could not be rejected. This indicates adequate model fit. The implications and discussions arising from this study are explained in the next chapter.

10.12 Chapter Summary

This chapter discussed the results of the questionnaire survey, descriptive statistics and the findings from the relevant reliability and validity that were carried out. Exploratory and confirmatory factor analyses were conducted and the model re-specification for the measurement models were performed. The second order factor model was then developed to test the fitting of the data collected with the hypothesised conceptual model. The standard factor loadings of the second order factor model were used to validate the hypothesis. The next chapter discusses the results from this field study and all the field studies embarked upon in the course of this study.

CHAPTER 11

TRIANGULATION OF RESULTS

11.1   Introduction

This chapter triangulates the results from the semi structured interviews, focus group discussions and the close ended questionnaire as well as the literature review. Emergent themes from the surveys which include assessing sustainable construction levels of practice and improvement mechanisms, existing building code, roles of major stakeholders for improvement are then further discussed under the themes identified for the study and then, related to the initial research questions for the study.

11.2   Summary from semi structured interviews

This section summarises the outputs of the semi structured interviews organised during this study. The study explored the opinions of construction practitioners representing government agencies, individual private businesses and contracting firms' backgrounds. The general perception of the respondents to the practice of sustainable construction in the area was that the level of practice was very low although it holds prospects for improvement if policies are adequately implemented to harness knowledge and improve practice. The benefits of implementing sustainable construction through policies was discussed and the need for active and strict policies in the Nigerian construction industry was stressed. The study yielded a few other outputs such as the importance of the 'political will' of the current government in power to getting things done. It was discussed that if an existing government wanted the practice of sustainable construction implemented, things will be facilitated within a short time. This points to the lack of a sustainable industry structure within the Nigerian construction industry as it poses the question what happens when there is a change in government? It is also a precursor to the need for enlightening policymakers within the construction industry on the need to improve practice and build strong institutional structures that will outlive democratic dispensations. The need for active facilitation with other main stakeholders to work in synergy and in tandem with government once the policy becomes functional was also touched on.

This study suggests that government must take some definite steps as the regulator of the construction industry especially in the formulation and implementation of policies for sustainable construction and create the legal backing for an improved building code. Granting of waivers and financial backing to motivate the process of implementing sustainable construction is also a regulatory function of the government. It was also noted that the existing document is prescriptive, and compliance centred, this creates a problem of not being actionable and assessing performance and benchmarking unlike performance-based building codes. The implementation modalities of the new proposed policy

document must also take note of the dynamics of the construction industry to ensure higher understanding and better outcomes.

The role of the government as a client was also discussed and it was agreed that this is critical in the realisation of government projects as the government is a major client of the construction industry in most developing countries. The need for the client to use the industry machinery of improved specifications in the realisation of sustainable construction initiatives from the preconstruction stages through project delivery. It was also agreed that the state of government projects across the country was deplorable and there is a need for improvements. In many developing economies, infrastructure provision is still largely tied to the government and the provision is often through contractors and consultants within the construction industry. This role of the government needs to be further understood and improved on within the construction industry.

The formation of a construction board was identified as a driver for improved sustainable construction practice. Opinions were divided but it was agreed to be a good idea, some respondents however questioned the functionality of existing bodies saddled with such and similar responsibilities. The creation of another layer of bureaucracy in construction processes was considered a factor that may hinder the practice of sustainable construction in Nigeria.

Green building councils were agreed to be very important for the growth of sustainable initiatives in the Nigerian construction industry, however, the formation and participation are challenges that indicate that there must be more adequate policy adaptation and research to suit the peculiar needs of the Nigerian construction industry. The need for improving research on local materials and processes was also highlighted to reduce costs and enhance sustainability.

The need for active synergy at the industry level was arrived at for the strategic action towards a sustainability transition within the construction industry. The need for policymakers within the industry to forge a common front and understand the impacts and processes of public policies in realising their objectives with the government was also discussed to enable easy transition to sustainability. Professionals, professional institutions, and other active stakeholders within the industry must also develop capacity, synergy and awareness within and outside the construction industry for improved delivery. Respect for professional boundaries and the need to act professionally in active service to clients was also discussed. Other stakeholders need to improve their capacity and knowledge base to meet up with sustainable construction practices once there is a strict policy in place.

The outputs generated from the semi structured interviews were relevant in refining the questionnaires later used for the quantitative aspects of the field survey especially on delineating the specific roles and expectations from the government and stakeholders in terms of policy formulation and the eventual implementation and enforcement.

11.3   Summary from focus group discussions

This section summarises the outcomes from the focus groups organised during this study. This study was conducted to probe and understand background issues surrounding the low implementation of sustainable construction practices within the Nigerian construction industry. The research aim was achieved through the literature review and collection of relevant data from different sections of industry practitioners. Qualitative data was obtained with two separate focus group discussions.

The study explored the opinions of construction practitioners from monitoring government agencies, individual private businesses and contracting firms' backgrounds. Responses varied from each focus group and even when there was agreement in the viewpoints, various other insights were brought into the discussions from the different groups based on their different experiential backgrounds. The benefits of implementing sustainable construction through policies was discussed and the need for active and strict policies in the Nigerian construction industry was discussed. While the building control agency focus group agreed that there is a considerable understanding and implementation of sustainable construction practice, the other focus group which comprised on site practitioners revealed that the level of practice is still very low and almost non-existent. While the building control agency group may be more informed theoretically on the situation and probably show an element of organisational bias, the other group expressed the practical situation as observed from the members. The need for a more practical way of delivery of sustainable construction through policies and collaborative implementation was evident from the discussions. The focus group stressed the need for improving sustainable construction training down to the artisanal level in the Nigerian construction industry to improve skills, minimise waste and drive innovation as a great deal of the practical work relies on the skills and capacity of the artisans on site.

While there have been some state government-controlled measures to improve on the building control processes in Lagos state, the implementation of the National building code was also discussed. There were varying opinions on the implementation status of the document. There was also a general understanding that the document is being underutilised and the needs for improvements were dire. While the control agency focus group believed that there is more need for the presence of construction professionals on the construction sites to monitor processes, the other focus group comprising on-site professionals noted that the lack of a legal backing and punitive efforts backed by the law is a major deterrent of the legitimacy and workability of the document. The group also noted that most times, the inspections carried out by the authorities are not thorough and that their verdicts are often inducible.

The role of the government within the industry needs to be defined and clearly understood and communicated to the government. Central among both discussions was the need for policies and a clear policy direction. Enacting laws on environmental friendliness and management was also discussed and seen as important. This gives a strategy for active participation and adequate inclusion. The Lagos State

Building Control Agency (LASBCA) focus group advocated for an active building control agency over all the country and the modalities for the implementation of the policies noting that there are existing policies that can be overhauled and improved upon. The second focus group discussed at length the need for government inclusion in the areas of financing the processes, through waivers and tax benefits on green and sustainable products as most of the goods will be imported. The need for a sustainable structure of policy operations within the industry was also discussed.

The role of the government as a client was also discussed at length. It was agreed that the government must understand this strategic position and then use it in influencing sustainable construction practices as it gives more comfort and reduced maintenance during the lifetime of the facility. The onus of this responsibility falls on the professionals who represent and advise the government in the realisation of public projects. It was generally commented that the current quality standards of most government projects are a concern and as such the approach must be changed for improved outcomes within the industry.

Drivers identified from literature such as the need for active synergy, construction board and implementing sustainable construction through the local governments were agreed to be welcome inputs, but cautions were made as to the formulation and workability. For the construction board, it was generally agreed that there is a need to leverage on the collective knowledge of the industry to chart a way forward in the implementation of sustainable construction initiatives. Comments arose as to the fact that there were existing bodies and agencies who had this oversight function as their responsibility, and they have not been active. It was suggested that diagnostic assessments be done on the non-functioning agencies to forestall the same fate.

On implementing sustainable construction through the local government, while agreeing that it might be a good idea, the Lagos state building control agency focus group agreed that some local government officials supply them information in the enforcement of their mandates, it was obvious that the local government staff were not in control of the process partly due to the fact that there are no active policies empowering them to enforce compliance to the industry norms on the clients/ developers. The need for clear and unambiguous guidelines and policy feedbacks especially at the local level was also discussed.

The focus group discussions despite projecting two opposing opinions based on the experience of practitioners revealed some unique insights. One of such is the need to train even the field workers on the site as against the general perception that sustainable construction practice is an elite perspective. The other insight noted is the fact that there exists some evidence of information sharing among the Building Control Agencies and the Local government enforcement units.

11.4   Relevance of the qualitative data to the preparation of the quantitative survey

The focus group interviews, and the semi structured interviews specifically revealed that the practice of sustainable construction in the Nigerian construction is currently at best an adhocracy without any regulatory or government induced initiatives. The focus of the study altered and centred more on the formulation of implementable policies as against the implementation of existing policies and harnessing existing extant regulations. It became clearer that the practice of sustainable construction in the Nigerian construction industry is at best currently implemented at organisational or individual firm level only based on individual management decisions and patterns and each individual client's expectations.

In reviewing the extent of the capacity of the local municipalities to adequately implement sustainable construction, due to the outcomes from the interviews and in line with bottom to top approaches in implementing the formulated agenda, it became apparent to consider adequate inclusion issues of local stakeholders and the need for adequate linkages with sustainable construction practice at different levels of government. The need for feedback and evaluation of processes and procedures was also highlighted. All these inputs assisted in refining the questionnaire to ensure a more practical assessment of the current scenario and the likely pathways to ensure success especially during implementation.

11.5   Summary from Questionnaire survey

This section summarises the output from the questionnaire survey organised to get professional opinions on the research topic. It also discusses the demographic composition of the respondents and the outputs of the validated study.

11.5.1 Discussion of the descriptive data

The industry survey gathered the demographic details of the construction professionals who participated in the study. The data was collected via internet enabled service and paper collection methods. The google doc internet enabled service resulted in a 66% response rate which was slightly better than the hand delivery and retrieval system which resulted in 64%. The overall average response rate was 65.5% and found to be acceptable when compared with the industry norm. The majority of the repondents were male (75.1%).

Almost all (98.5%) of the respondents were core construction professionals with 74.9% having 5 years experience in practice. About ninety three percent (92.4%) of the respondents have high concerns about sustainability with regards to their workplace practices and personal knowledge. Over 60% have a moderate knowledge and 31% have high knowledge of appropriate strategies and policies on sustainable construction. On familiarity with the Nigerian building code, about 64 % have a moderate knowledge and 24% have a high knowledge of the subject matter.

11.5.2 Discussion of the validated second order factor model

The path model analysis that was conducted showed that all the four hypothesized relationships were found to be significant. There were four relationships between the independent variable (improved sustainable construction practice) and the dependent variables. The following sections discusses these four relationships.

11.5.3 The role of the Government as a Regulator

The relationship between the *role of the government as a regulator* of the industry and an *improved sustainable construction practice* in developing countries was found to be significant. The finding shows that regulatory moves and policies of the government have a profound effect on the construction practice generally and on sustainable construction particularly in developing countries. It is argued that for both developed and developing countries, government is largely saddled with the provision of regulations, policies and guides. This lays a workable structure and system for the industry to develop and meet its targets. The direction and provision of participatory financial initiatives such as green bonds, tax waivers etc. for the kickstarting, and management of these processes is also key to the success of the policies and regulatory instruments. Improving awareness and ensuring compliance are also key to the success of the regulatory roles.

11.5.4 The role of government as a client

The relationship between the *role of the government as a client* and *improved sustainable construction practice* was found to be significant. This finding shows that the activities and actions of the government as a client of the industry influences sustainable construction practice in developing countries. It is argued that in most developing countries, the government is the highest client as it involves the provision of infrastructure for the citizenry and improving the quality of life generally. Improving on this role influences innovation and encourages process improvements especially from procurement by ensuring its own projects are done in line with sustainable construction trends and that qualified and informed professionals are employed on its own projects. Improving on client requirements and specifications to performance based standards and utilising green and sustainable materials are also key to improvements in the execution of this role.

11.5.5 Stakeholder's input to sustainable construction practice

The relationship between *stakeholder's input* and *improved sustainable construction improvement* was found to be significant. This finding shows that the actions and inputs of the stakeholders improve sustainable construction practice in developing countries. It is argued that improved coordination of professional bodies and relevant stakeholders (academics, contractors, research institutes and artisanship) within the construction industry through boards (Ofori, 2012), Green Building Councils (Akinshipe *et al.,* 2019; Ude and Ude, 2014) and adequate synergy, collaboration and teamwork (FGN,

2006) will improve sustainable construction practices and innovation localisation within the construction industries of developing countries. Ensuring training, awareness and compliance through continuous professional development and keeping a capacity profile/database of contractors are also argued to be key to the realisation of improved sustainable construction practice. Understanding the policy cycle and realising the need for utilising it to achieve rational outcomes in a democracy is key for professional bodies and stakeholders within the industry to building stronger structures and thereby improve sustainable construction practice.

11.5.6 Agenda Implementation Strategies to improving sustainable construction practices

The relationship between the *implementation strategies* and the success of the *improved sustainable construction practice* was found to be significant. This finding shows that the implementation modalities for the agenda for improved sustainable construction practice is very relevant and has an influence on the success of the endeavour. It is argued especially in the Nigerian scenario that there were fundamental policy setting issues in the policy formulation, regulations and legitimacy of the current building code and it was identified as one of the reasons why the implementation was quite problematic. It is also argued that the use of bottom to top approaches, efficient use of participatory moves and following the steps of the policy cycle should yield better outcomes. Practicing sustainable construction is a localised practice linked with a national strategic goal of the industry. As a result of this, it was argued that utilising local governments and municipalities in the developing countries will reach better outcomes and coverage, however, capacity improvements and improved enlightenment will also be necessary. The use and importance of policy feedbacks and evaluations as an effective way of improving the policies and adaptation to the local requirements of the community and municipality was noted as important.

11.6 Triangulation Summary

11.6.1 Perception of sustainable construction practice

According to the literature, evidence of sustainable construction practice was rife as there was a copious amount of published literature on different aspects of sustainability in the Nigerian construction industry. Although not many articles discussed the centrality of policies to drive sustainable construction, the studies however realised the need and advocated for policies to improve sustainable construction practice. There were also documents that called for the upward review of extant laws and trends to cater for sustainablity especially in the environment generally, without any focus on the construction industry in particular.

The focus group discussion held with the Building Control Agency (BCA) staff generally held the notion that although the knowledge base of the clients in the construction industry is low as regards sustainable construction, minimum standards are being improved upon especially in cities and with the

efforts of the BCA in the city area, enlightenment is getting better. The other focus group revealed as well that the practice of sustainable construction in the area is low especially as regards residential buildings. Noting that the input of sustainable construction is rarely seen in residential buildings where such clients focus mainly on acquiring a shelter, commercial buildings tend to have ideal project structures that make the inputs of sustainable construction easier.

The structured interviews provided insights that the major cities of Abuja and Lagos are being planned and improved with the input of some byelaws. Being the capital cities of the country, the planning and construction laws are more defined, stringent and enforceable. The general awareness towards sustainability and sustainable construction in particular is better than other parts of the country.

With the realisation that the level of implementation of sustainable construction practice was low, the questionnaire was improved to focus on areas where there was a need for sustainable construction policy in terms of formulation, participatory advocacies and eventual enforcement. The questionnaire also delineated roles to specific and major stakeholders in the industry.

In all, the practice of sustainable construction was found to be low within the industry, slightly better in the capital cities and more urban areas. However, until specific and active roles are undertaken by main stakeholders in the construction industry, the practice will likely not improve much towards sustainable construction.

11.6.2   Challenges with sustainable construction practice

The literature revealed that the practice of sustainable construction in the industry is affected mainly by lack of government's input in the aspects of awareness and attention, policy, empowerment and enforcement. Coupled with the aforementioned is the lack of a strategic response or call for action from the active stakeholders within the industry such as professionals, clients and contractors.

The Building Control Agency focus group believes there are existing policies but that a lot of them need to be majorly revised to meet current day realities and challenges. The discussion summarised that if building control agencies are introduced at state levels to carry out some functions, some of the challenges will be settled. The second focus group believed that active policies are a bane for sustainable construction efforts in Nigeria. Dedicated procedures and personnel are also very vital in ensuring the active policies are adequately implemented. The improvement of artisanal skills and training was also seen as a challenge to the improvement of sustainable construction within the industry.

On the challenges noticed by the interviewees, divided interests among policy makers, stakeholders and individual professionals was seen as a prime challenge of sustainable construction practice. The political will of the government in power at the time was also agreed to be an important determinant of the way

things will go. It was also revealed that existing agencies for the improvement of the Nigerian construction industry may have been compromised as there have not been desired outputs. Hence the need for a thorough reevaluation of such agencies before being resaddled with new objectives.

The questionnaire tried to sort out the challenges noticed in the interviews and realised that the best plans may encounter implementation challenges which may hamper its chance of success. In the light of this, inclusion of active stakeholders at the unitary (municipal) level was considered and included as a focal point in the depth of the study. The inclusion of feedback mechanisms for evaluation and policy improvement also creates an avenue tor the sustainability of the initiatives proposed.

11.6.3 Government as a Regulator

In the review of literature, it was revealed the various roles expected of the government to effectively transition the Nigerian construction industry towards sustainability. Regulatory roles and client related roles are separated. The regulatory roles include the development and utilisation of policy frameworks such as a performance building code as against the prescriptive and non-functional existing building code. The legal/regulatory backing expected to assist the building code so that violators are reprimanded was also harped upon. The use of participatory approaches such as efficient utilisation of green bonds to effectively deliver public projects and the improvement and utilisation of industry research in project delivery also were assessed to have a high input towards achieving sustainability.

In having an improved sustainable construction practice, the Building Control Agency focus group related that clear policies, enlightenment of clients and ensuring that professionals are engaged on construction sites will ensure success. Provision of policies from the government and upgrading the new ones was seen as a major driver as professionals do not like to be on the wrong side of regulations as they know consequences exist for such professional misdemeanors. The second focus group agreed that the role of the government in the propagation of sustainable construction for the industry is indispensable especially with regards to policies and effective implementation. All levels of the government (federal, state and municipal) were agreed to be relevant especially in this regard.

The responses from the semi structured interviews in this regard centred on the need for Government policies within the construction industry to establish and grow for the industry, a structure that will be distinct from political interference. This was agreed to be important to grow the industry and help in the organisation and coordination of the industry and poise it towards a more strategic output. Regulations affecting practice were also advocated for where in, professional boundaries are strictly respected and observed by practising professionals within the industry. The need to have local building materials that can be standardised for sustainable construction practice was also discussed by some of

the interviewees. This was to forestall high costs and often low durability of some imported building products.

The quantitaive study focused on the provision of a sustainable building regulations and other necessary policy documents relevant to improving sustainable construction practice in the Nigerian construction industry. The need to invest in policy adaptation and local research especially on innovations and local building materials that are climatically suitable for the Nigerian weather was factored into the research instrument. The knowledge acquired from research was judged to be adequate in driving the industry to become a knowledge driven industry.

11.6.4 Government as a Client

The role of the client as a trend setter in the construction industry is discussed briefly in the literature. The industry exists to satisfy the requirements of its clients in the delivery of projects and services. The government as a client of the industry is critical to the indutstry also in this regard. The government in Nigeria as a developing country is in charge of basic and public infrastructure. The use of clients requirements through specifications, project briefs etc. has not been fully utilised for the propagation of sustainable construction in the industry. Government being a major client can also ensure that the standard is followed through in all its operating levels with a reward or sanctioning on the performance of contractors engaged on its projects. Creating a market boom for sustainable materials and improving/ simplifying approval processes for works were also highlighted in the literature.

Discussants in the focus group associated with the building control agency opine that adequate enforcement of existing laws will make clients not want to go against existing active regulations. The discussants also noted that the state of public infrastructure is deplorable and it is likely due to the government not being active with its role as a client. The focus group with construction professionals noted that the government as a client have a lot of input to make but that the drive for profit and short term gains are a barrier coupled with the lack of dedication of its executioners and representatives.

The consensus of the structured interviews was that the roles of the government as a client of public projects and the industry has been neglected for while as agencies saddled with the responsibilities of ensuring quality, cost and time fundamentals have not exactly been functional within the industry. The interviews noted that the private sector had been championing innovations in the industry although in their little capacities.

The questionnaire survey captured the roles of the government as a client to include ensuring that all its project are done in line with sustainable construction trends especially that ministries and departments under the government key into the vision of the government. Motivating performance of contractors who conform to sustainable construction practices and utilising clients requirements and specifications

and sustainably to ensure improved delivery were seen as some of the relevant inputs of the government as a client. Bureaucratic processes that surround the release of client approvals and government approvals on planning is also where improvements are needed. All these were components of the survey analysed in chapter 10.

11.6.5 Stakeholder's Input to the Sustainable construction practice

The need for collaborative efforts and inter-disciplinary synergy in building a more resilient construction industry was highlighted in the literature. Construction boards to promote and manage innovations and green building councils to propagate the knowledge of sustainable construction in the industry was also opined in the literature review chapters. The need for active collaboration at all levels and most fundamentally at the municipal levels was arrived at.

The focus groups maintained that the stakeholders, most importantly the professionals within the industry need to invest more in research. It was also agreed that sustainable construction practice was impressioned by the professional elites within the industry but was not been explained to the site workers, hence the gaps exist and the need to involve more in artisanal training and enlightenment of contractors as they are the ones that will actually execute contracts. The need for transferring knowledge acquired from exposures and professional training by managers down the organisational ladder was also discussed to be relevant. The need for an active collaboration and synergy also came into this discussion with professional boundries and professionalism being key.

The interviewees agreed on the need for functional systems and machineries within the industry for the delivery of innovative and sustainable solutions. Some interviewees questioned the issues surrounding the non performance of existing agencies expected to deliver such objectives and caution that before newer solutions are provided, a diagnosis of the existing agencies will be in order to prevent a repeat of non performance in the new solutions being proposed. Some suggested a reorganisation of the existing agencies into one functional body saddled for the responsibility.

The questionnaire considered the organisation of the industry in line with sustainable construction practices especially in the areas of contractors management and performance. Industry strategy and synergy were also assessed to be relevant inputs to stakeholders improvement of sustainable construction practice. A construction board was adjudged best to harmonise all these needs not within the professional organisations existing in the industry but rather above them so that the construction board can have regulatory functions over the professional bodies. Knowledge transfer and policy propagation through the Green Building Councils, academics and lifelong learning and continuous professional development CPD for practicing professionals was also expected to be very relevant to practice.

11.6.6 Agenda Implementation Strategies

The literature captured the need for inclusiveness of all active members in the proposed implementation of the policy to have the legitimacy it deserved especially by advocating and informing participants on the benefits and needs of sustainable construction practice by people at the grassroots or people who may not have in-depth industry experience. This also involves keeping the steps to be taken simple, easily linked and understandable. The study also identified bottom to top approaches as having a wider reach and better means of implementation success for sustainable construction practice. In line with the national and state wide policy, enforcement should be local. Also, there needs to be a periodic evaluation of the policy in practice for policy feedbacks and possible improvements.

The Building Control Agency focus group revealed that at the state level, the municipality units have been helpful to them in terms of information sourcing and coverage in their enforcement strides, however, the authority resides at the state level as the municipalities are not empowered to perform. While maintaining that it will be a very nice to involve them in the implementation phase, the municipalities are currently weak inensuring sustainable construction practice in terms of capacity and training requirements. They are also reported to be prone to easy inducements which may hamper the implementation progress.

The structured interviews elucidated varied opinions on the need to involve the local government in the enforcement of sustainable construction practice especially on the leadership and capacity of the local counties. It was later concluded that if there is an effective policy in place, everyone will buckle up to the responsibilities expected. There was also the discussion of developing relevant templates to suit different localities and climatic requirements.

The questionnainre survey captured all the relevant aspects of inclusiveness of stakeholders, embracing the diversity and local needs of each area under consideration, namely, utilisation of the municipalities and empowering them with capacity training, aligning local municipal programmes with state and federal programme for monitoring and strategy coordination and keeping the details of the whole process simple to facilitate easy assimilation. A multilevel supervision and monitoring was also factored in to ensure success. Feedbacks, measurement and evaluation avenues were also assessed as parts of the implementation strategy for improvements and better success.

11.7   Translating Outputs from the Study into Policies

Studies from policy making have explained the policy cycle and necessary steps towards sustainable policy formulation in chapters four and five. Furthermore, policy mixes have been suggested as a likely way for the implementation of sustainability especially in the context of transitioning from traditional methods of practice to more improved and sustainable construction practice. The specific roles expected of the government being the regulator of the economy and the roles of all relevant stakeholders were identified as outputs of the conclusions from the study. However, there is a need to explain how the conclusions will be transformed into policies or a policy framework for the improvement of sustainable construction practice in Nigeria. The translation of conclusions to policies will be discussed based on isomorphism and legitimacy pressures. Isomorphism is a measure of the type of policies and the attendant change expected. Isomorphic changes are classified as coercive, mimetic, and normative.

Coercive isomorphic changes refer to changes made in a situation wherein due to external factors and by cultural expectations, the government institutes policies, mandates, and/or laws. There have been agitations and calls to the government from both internally and externally to the construction industry for the use of both regulatory and non regulatory measures to enforce sustainable construction practice. These calls are partly occasioned by the high incidents of building collapse and poor planning of cities which in turn lead to loss of lives and property. The required policies and regulations are expected from the government as the major regulator of the industry. They include the provision of regulatory and legally enforceable documents, enforcement and compliance mechanisms and setting industry and market targets for sustainable construction practice.

Normative isomorphic changes apply to a series of changes brought about by professionalism, ethical norms, professional standards and systems and/or network influenced changes which will mean a coalition of some professional bodies within the industry. In line with this study, these are expectedly acted upon by coordination boards, contractor management organisations, green building councils and professional institutes within the construction industry.

Mimetic isomorphism indicates a type of change brought about by organisational benchmarking and uncertainty in a bid to achieve better outputs. It is often organisation or project based with the sole aim to improve on its deliverables and competencies in service delivery to the end users or clients. In the context of this study, government acts as a client as government is the sole provider and facilitator of public utilities. This role often changes to clients/ financiers and end users as the economy grows and the government privatises or concessions the management of such utilities to private investors.

It was found in this study that the best policies may fail if there is no strategy for implementation and in this aspect of the study, a mix of the policy implementation strategies are to be advocated.

Enforcement is the key even at the local / municipal stage of implementation and individual project level. At the same time, there is a constant need for monitoring and evaluation from higher tiers of the government to ensure compliance and conformity to laid down guidelines. In the same vein, it is important to measure the impact of the policy and the need for improvements and evaluation if necessary.

Policy effects and legitimacy have been theoretically addressed in the study as the study sought inputs from stakeholders and industry policy makers through focus groups and the semi structured interviews while outputs from these studies assisted in the quantitative survey. If the actions of a firm/ organisation or industry are questionable or not agreeable with some certain norms, then the body will face legitimacy pressure. Legitimacy pressures are usually the pressures that ensue between the regulatory bodies and the organisation or between the organisation and its clients or customers.

Legitimacy pressures are generally classified as regulatory pressures, normative pressures, and cognitive pressures (DiMaggio and Powell, 2000). For firms, regulatory pressures mainly stems from governmental agencies, while normative pressures generally arises from customers, advocacy groups, and non-governmental organisations who may be environmentally affected by the effects of the organisation, while cognitive pressure is mostly from market forces and competition (Berrone, *et al*., 2013).

An improved sustainable construction practice in the context of this study is a construction practice environment properly institutionalised and managed as discussed in the context of developed economies in chapter 2 and strategic in operations to meet the economic, social and environmental demands of sustainability in empirical and measurable terms.

11.8 Chapter Summary

This chapter has highlighted the findings of the studies undertaken in earlier chapters. The studies included the semi-structured interview, focus groups and the questionnaire survey. The descriptive details of the respondents were explained briefly. The validated structural model was also discussed. The findings were harmonised based on the literature reviews earlier conducted utilising a triangulation approach. The next chapter summarises the findings of the research and provides recommendations for further studies.

CHAPTER 12
CONCLUSION AND RECOMMENDATIONS

12.1 Introduction

This chapter deliberates on the outcomes of the research study and presents conclusions drawn from findings. Limitations of the study are presented and contributions of the research are briefly outlined. Areas for further studies are suggested and concluding remarks are made.

12.2   Research Objectives

Construction practice is generally regulated around the world. These regulations tend to define the extent of the rights and expectations of various stakeholders. It also benchmarks practice ensuring that there are improvements in project and service delivery within the construction industry. The practice of sustainable construction in developing and developed countries is guided by some of these underlying priorities. While the improvements in sustainable construction practices are generally noticeable in developed countries, this is not the case in most developing countries. This creates a lacunae of how can developing countries also improve on the practice of sustainable construction as it presents benefits for the industry and its stakeholders. In line with the delivery of sustainable development goals, sustainable construction practices promote resource efficiency, environmental protection and the need to improve construction practices generally. The need for adequate policy implementation for sustainable construction in developing countries prompted this study.

The key research question of this study was ''how can construction practices be improved and made more sustainable in developing countries through government and industry policies?'' The main research question was further simplified by seeking to understand the level of sustainable construction practice in a developing country. It was imperative to study the extent level of sustainable construction practice and policy implementation in developed countries, some selected sub-Saharan African countries and use the knowledge gained from these insights to understand the Nigerian scenario. Having identified the gaps from the scenarios presented from various countries it was also important to understudy the existing scenario (policy documents, policy implementation and gaps) identified through a policy view. By identifying policy barriers and drivers, it was necessary to propose a policy framework for the realisation of sustainable construction practice in developing countries.

12.2.1   Research Question 1

The first research question was to understand how sustainable construction is practised and regulated in the Nigerian construction industry. To achieve this, it was necessary to assess countries with improved sustainable construction practices and also some countries within the geographic region. An

extensive literature review was undertaken to identify the gaps in practice in the sustainable construction policy and practices compared with other developed and developing countries. Though there was a copious amount of published materials on sustainable construction practice there was very little on any existing policy to drive the practice. It was noted that there was a need to understand why this low implementation persisted vis-a-vis what can be done to improve the current situation. Identified gaps obtained through the literature were structured into field instruments and used to confirm the real life situation during the field study.

The semi structured interviews indicated that sustainable construction practice is generally low in the country save for the capital cities of Lagos and Abuja and that the lack of the political will of the government in realising improved outcomes is quite visible. The focus group discussions also noted that the level of practice is not encouraging but that efforts are being made through the Building Control Agencies and organisational heads. If these are instituted all over the country, appreciable outcomes will be achieved. The questionnaire survey revealed that there is a need for more active participation of the regulator, client professional stakeholders and implementers for effective sustainable construction practice.

12.2.2 Research question 2

The second research question was to assess the level of awareness of stakeholders towards the implementation of sustainable construction in Nigeria. This research question was addressed by the further use of the comprehensive outputs of the literature reviews in semi-structured interviews and focus groups conducted in the Nigerian construction industry. Preliminary questions that bothered on the importance and need for sustainable construction policy and practice were asked and conclusions arrived at through analyses of respondents.

The literature review revealed that professionals are aware of the practice of sustainable construction although there might be need to train and retrain to an extent to enhance existing knowledge. The semi structured interviews also relate that there is evidence of adequate awareness among the practitioners although from different perspectives. However, the need to collectively inform the government maybe through a board of experts by harnessing the benefits to the government and citizenry is identified as important. It is pertinent to inform and advise the government being the regulator and a main stakeholder and driver of the industry direction.

The focus group revealed that although there is evidence of awareness, there are no clear policy documents and direction. As such, professionals and contracting organisations do not feel compelled to implement sustainable construction and may only implement best practice when there is a need to exhibit competitive advantage. The questionnaire survey indicated that sustainability is a major concern in about 93% of the organisations surveyed and about 91% of the respondents have a moderate to high level of knowledge in sustainable construction. Being a random sampled survey, it can be agreed that

the knowledge and awareness of stakeholders (practitioners) is high. However, there is a need to adequately identify the specifics on sustainable construction knowledge in the Nigerian construction industry context to ensure it is measurable in future studies.

12.2.3 Research Questions 3 and 4

These research questions involved identifying the policy barriers and drivers toward the implementation of sustainable construction policies and practices in the Nigerian construction industry. The first part of these research questions was achieved through the literature review chapter that focused on policy making and how the Nigerian construction industry can optimise the existing policy architecture in the country to improve sustainable construction practice. From the agenda setting on the policy to the policy feedback mechanisms that the industry can utilise to improve its existing structures. This was important to improve the legitimacy of the policy when implemented. A conceptual framework for the improved sustainable construction practice model was thereafter developed. Some of the drivers identified in the literature review could not be empirically ascertained and were subjected to qualitative enquiry through the focus groups and semi structured interviews. The other drivers and barriers contributed to the research instruments used for the quantitative field surveys in this study. They were structured in to expected roles (factors) of each major stakeholder within the industry. The roles of the government as the regulator of the industry, the roles of the government as a client to the industry in utilising sustainable construction, the input of the stakeholders (professionals, contractors etc.) within the industry and the utilisable policy strategies to ensure active participation and success of the proposed policy were conceptualised into a policy framework. Four major factors comprising forty six (46) elements were identified in the research instrument towards the improvement of sustainable construction practice in the country. The specific objectives were met and the research questions answered.

12.2.4 Research Question 5

This research question involved the validation of the conceptual policy framework developed earlier for the improvement of sustainable construction practice in the Nigerian construction industry. From the quantifiable identified barriers and drivers in research questions 3 and 4, an inquiry instrument for the Nigerian construction industry was developed. The questionnaire survey was piloted and refined thereafter. It was distributed to a random sample of 380 respondents and 249 responses were found useable for the purposes of the validation of the constructs. The validation was thereafter achieved and the hypotheses tested and the factors found significant were thereafter explained. The interpretations of the findings were explained and the policy framework for improved sustainable construction practice was proposed. An improved sustainable construction practice was identified as one in which there is a clear structure from the regulating body mostly government with the input of active stakeholders and clear cut direction and stakeholder participation in the formulation, implementation and feedback

mechanisms of policies and targets. The need for active structures within the industry and mesoeconomic studies to improve components of the industry. The objective was achieved and the corresponding research question answered.

12.3   Contributions of the study

The findings of this research significantly contribute to the evolving current body of knowledge in driving the impacts of policy and sustainable construction especially in the context of developing countries. As discussed below in subsequent sub-sections, the contributions of this study have practical, industry, academic and methodological significance.

12.3.1 Practical contributions

The findings of the research provide guidance on the need for the construction industry (professional institutes and professionals) of developing countries to seek inter-professional collaborative efforts to improve the practice generally in order to deliver improved and innovative technologies (in this case, sustainable construction).

The role of the government in the administration and policy direction for the industry is critical to the realisation of an improved sustainable construction practice. The industry stakeholders must therefore be proactive and communicate this jointly and clearly to the government and policymakers of the industry. The need for a working structure is key. Professionals and institutions can incorporate the key factors identified and validated in this study into their proposed working documents.

The validated model provides clear direction to policy makers, councils, professional associations and relevant statutory organs to develop an appropriate structure, guidelines, regulations and policies to ensure innovation and improved sustainable construction environment.

12.3.2 Academic contributions

This research provides a better understanding of key policy factors necessary for an improved sustainable construction practice especially in the context of developing countries. The relationships between these factors and the necessary inputs from stakeholders were defined. The results also broaden the knowledge of the relationships and indicate the necessary steps to be taken in actualising a more improved sustainable practice environment. As indicated in section 11.5, this study lays a foundation for further research in the areas of policies fomulation and implementation for sustainable construction in developing countries.

12.3.3 Methodological contributions

This study followed a three phase research methodology to validate the research instrument used in the research. The first phase involved desktop studies on the subject matter with relation to the policies and practice of sustainable construction on developed and developing economies. Content was gathered and collated. The second phase included content investigation and validation through semi-structured interviews and focus groups with active players in the construction environment. These inputs were employed to validate the instrument content wise. The third phase involved construct validity where exploratory factor analysis and confirmatory factor analysis were conducted. The exploratory factor analysis was conducted using SPSS while the confirmatory factor analysis and model validation were done using structural equation modeling where the relationships between the different variables in the proposed model were determined. Being a mixed study methodology research, cross validation and triangulation of all findings from the field surveys were harmonised and conclusions arrived at.

12.4 Limitations of the study

Limitations of a research concerns potential weaknesses outside the direct control of the researcher. Limitations are important to state the difficulties faced in carrying out the research (Theofanidis and Fountouki, 2018). Limitations encountered in the course of this research are outlined as follows:

12.4.1 Limitations for the Qualitative study

- The data collection for the semi structured survey and focus group discussions were based on non- probabilistic purposive sampling techniques. Responses came only from those who were available and willing to participate in the study, so no claims of generalisability could be made beyond the cases considered in the study;

- The findings of this research relied on the opinions of the professionals within practice and the data collected from construction professionals. No attempt was made to conduct a case study and evaluate effect of design considerations on construction and operation stages of infrastructure systems.

12.4.2 Limitations for the Quantitative study

- This study employed a structured questionnaire to collect opinions of respondents using subjective measured variables. Responses could be exposed to bias when subjected measures are used specially in cases where self-reporting survey instruments are used;

- The quantitative industry survey conducted in this study targeted only core construction professionals. The inclusion of the perceptions of other stakeholders including clients, contractors, sub contractors and end users could provide a more complete picture;

- An analysis of the impact of demographic information of respondents on their response was not conducted;

- The conceptual model developed in this model was validated using the data collected from construction professionals in Nigeria. No attempt was made to make comparisons with other developing countries.

12.5   Recommendations for further study

This research has contributed to the body of knowledge in the area of policies, sustainable construction and innovations generally within the built environment of developing economies. This study is exploratory and the results that emerged from this research implied that there are several areas to be studied in the future. The suggestions for further studies are made based on the limitations of the research.

- Future studies in the area of policy making within the construction industry should include perceptions and opinions of more stakeholders including the government, clients, contractors and end users.

- The model presented in this research provided a basis for further development. The need for clear communication and strategic agenda building between the active stakeholders identified in the model should be improved in developing countries. Follow up studies could be conducted to develop a framework for practical implementation of the model developed in this research.

- Follow up studies should attempt to include longitudinal research techniques and case studies to assess the impact of the policies in implementation and feedback stages of facilities.

12.6   Conclusion

This research attempted to provide a well-defined and basic model for improving policies for sustainable construction practice in developing countries with a particular emphasis on Nigeria. The policy framework proposed will lay a foundation for development of appropriate policies, regulations, procedures and guides for improved sustainable construction practice. Several recommendations were drawn from the findings of the research. The research has outlined its limitations and suggested recommendations for further studies.

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Appendix A- Ethical Clearance

UNIVERSITY OF ™
KWAZULU-NATAL
INYUVESI
YAKWAZULU-NATALI

15 April 2020

Mr Anthony Ayotunde Babalola (218056620)
School Of Engineering
Howard College

Dear Mr Babalola,

Protocol reference number: HSSREC/00000537/2019
Project title: Effects of construction policies towards building a framework for the implementation of sustainable construction in developing countries.
Degree: PhD

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 12 September 2019 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid until 15 April 2021.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,

Professor Dipane Hlalele (Chair)

/dd

Humanities & Social Sciences Research Ethics Committee
UKZN Research Ethics Office Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Tel: +27 31 260 8350 / 4557 / 3587
Website: http://research.ukzn.ac.za/Research-Ethics/

Founding Campuses: ■ Edgewood   ■ Howard College   ■ Medical School   ■ Pietermaritzburg   ■ Westville

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SCHOOL OF ENGINEERING
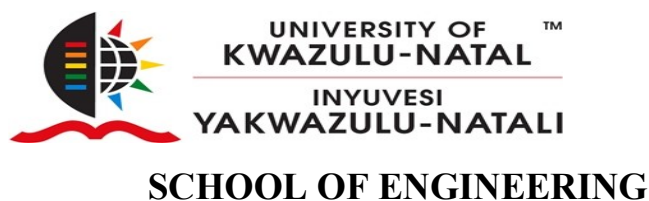
LETTER OF INVITATION FOR PARTICIPATION IN A SEMI STRUCTURED INTERVIEW

Title:

Office Address:

Phone No:

To whom it may concern

Sir/ Madam,

My name is Babalola Anthony Ayotunde, a PhD research candidate at the University of KwaZulu Natal, Durban, South Africa. I am conducting a study on the ''**Effects of Construction policies on sustainable construction towards developing a framework in developing countries''.** The need for more improved policies for the management of the construction processes in the Nigerian construction industry necessitated this study. The aim of this study is to investigate this problem with the views of articulating appropriate strategies for the improved uptake of sustainable construction practice within the construction industry.

The purpose of this interview is to obtain your opinion as a stakeholder in the industry with requisite knowledge of sustainable construction policies and practice and how the current situation can be improved upon. The interview is estimated to last two hours maximum.

Let me assure you that the data collected from you through this interview and any documentation from you shall be treated confidentially and be used solely for academic purposes. Also, no records shall bear the name of your organisation. I will like to seek your permission to record the interview to enable compilation afterwards.

Details of the location and time for the interview shall be communicated once you signify participation.

Thanking you for your anticipated cooperation.

Request for Audio recording   Yes ☐   No ☐

Mr. Anthony Ayotunde Babalola   **Dr Nishani Harinarain**
PhD Candidate, UKZN   Research Promoter
Tel: +27 67 081 5073 (South Africa)
       +234 703 257 4570 (Nigeria)
Email: 218056620@stu.ukzn.ac.za

SEMI STRUCTURED INTERVIEW QUESTIONS

1. What is your perception of the level of sustainable construction practice in the Nigerian construction industry and in this location specifically?

2. What do you perceive to be the major challenges to the full uptake of sustainable construction in our industry?

3. What are your views on the benefits offered by sustainable construction? Please expatiate

4. In your assessment, is the Nigerian Building Code being actively implemented across the industry? How?

5. Would you agree that monitoring and implementation of the building code should be restricted to a profession or a government agency alone?

6. What do you think is the penalty for violation of the Nigerian Building Code to a client?

7. Incidents of badly constructed buildings, collapse of buildings, unlawful erection of buildings are still common in this environment, how do you think this can be solved? What do you think are responsible for these?

8. Is there a need for synergy within the construction industry among all players/ professionals in your experience?

9. This synergy referred to in (8) above, would you say it is needed at project level, professional level or supervisory board level?

10. Can this synergy help in the implementation of sustainable construction policy?

11. Is there a need for a Construction Board for coordination and new knowledge implementation within the industry?

12. What is your view as to the establishment of a Green Building Council for improved sustainable construction and green buildings implementation? What moves can be made?

13. Which arm of government or agency of government do you suggest will have a better coverage of the monitoring of sustainable construction processes?

14. Does the government have roles to play in the uptake of sustainable construction in the industry?

15. What roles do you think Government should play as the regulator of the built environment?

16. Are these roles identified in (15) being adequately addressed by the government? How can they be harnessed and improved upon?

17. Do you think the Government has a role to also play as a client of the industry?

18. How do you think we can improve the implementation of the Nigerian building codes?

19. The Nigerian Building code looks quite voluminous and perhaps uninteresting to people outside the construction industry, do you believe making drafts and summaries of the Nigerian Building code will make it more understandable to the common public?

20. What are your suggestions for inputting sustainability into our construction practice in the Nigerian construction industry especially in policy formulation and implementation?

21. Are strict policy regulations on sustainable construction likely to work better for the construction industry?

22. What do you think various stakeholders can do to improve sustainable construction in practice?

23. What do you think about the local government professional team being an active enforcer of sustainable construction and building regulations as stipulated by the building code? Do you think they have been active in the performance of this duty?

24. Closing points, any advice on the way forward??

Thank you all for sparing time out of your busy schedules to make this meeting possible. I wish to thank you for enriching our insights with your wealth of experience. I have gained a lot which will help in compiling data for this research.

APPENDIX C- FOCUS GROUP DISCUSSION TEMPLATE

SCHOOL OF ENGINEERING

LETTER OF INVITATION FOR PARTICIPATION IN A FOCUS GROUP INTERVIEW.

Title:

Office Address:

Phone No:

To whom it may concern

Sir/ Madam,

My name is Babalola Anthony Ayotunde, a PhD research candidate at the University of KwaZulu Natal, Durban, South Africa. I am conducting a study on the ''**Effects of Construction policies on sustainable construction towards developing a framework in developing countries''.** The need for more improved policies for the management of the construction processes in the Nigerian construction industry necessitated this study. The aim of this study is to investigate this problem with the views of articulating appropriate strategies for the improved uptake of sustainable construction practice within the construction industry.

The purpose of this focus group interview is to obtain your opinion as a stakeholder in the industry with requisite knowledge of sustainable construction policies and practice and how the current situation can be improved upon. The interview is estimated to last two hours maximum.

Let me assure you that the data collected from you through this interview and any documentation from you shall be treated confidentially and be used solely for academic purposes. Also, no records shall bear the name of your organisation. I will like to seek your permission to record the interview to enable compilation afterwards.

Details of the location and time for the interview shall be communicated once you signify participation.

Thanking you for your anticipated cooperation.

Request for Audio recording   Yes   ☐   No   ☐

Mr. Anthony Ayotunde Babalola   **Dr Nishani Harinarain**
PhD Candidate, UKZN   Research Promoter
Tel: +27 67 081 5073 (South Africa)
      +234 703 257 4570 (Nigeria)
Email: 218056620@stu.ukzn.ac.za

FOCUS GROUP DISCUSSION QUESTIONS

1. What is your perception of the level of sustainable construction practice in the Nigerian construction industry and in this location specifically?

2. What do you perceive to be the major challenges to the full uptake of sustainable construction in our industry?

3. Do you think Sustainable constriction offer some benefits at all? Please expatiate

4. Do you think the Nigerian Building Code is being actively implemented across the industry? How?

5. Do you think the monitoring of the implementation of the building code should be restricted to a profession or a government agency alone?

6. What do you think is the penalty for violation of the Nigerian Building Code to a client?

7. Incidents of badly constructed buildings, collapse of buildings, unlawful erection of buildings are still common in this environment, how do you think this can be solved? What do you think are responsible for these?

8. Do you think there is a need for synergy within the construction industry among all players/ Professionals?

9. Do you think the synergy is needed at project level, professional level or supervisory board level?

10. Can this synergy help in the implementation of sustainable construction policy?

11. Do you think we need a Construction Board for coordination and new knowledge implementation within the industry?

12. What is your view as to the establishing of a Green Building Council for improved sustainable construction and green buildings implementation? What moves can be made?

13. Which arm of government or agency of government do you suggest will have a better coverage of the monitoring of sustainable construction processes?

14. Do you think the Government has any role to play in the uptake of sustainable construction in the industry?

15. What roles do you think Government should play as the regulator of the built environment?

16. Do you think these roles are being adequately addressed by the government? How can they be harnessed and improved upon?

17. Do you think the Government has a role to also play as a client of the industry?

18. How do you think we can improve the implementation of the Nigerian building codes?

19. Do you think the Nigerian Building code is too voluminous and perhaps uninteresting to people outside the construction industry? Do you believe making drafts and summaries of the Nigerian Building code will make it more understandable to the common public?

20. What are your suggestions for inputting sustainability into our construction practice in the Nigerian construction industry especially in policy formulation and implementation?

21. Do you think strict policy regulations on sustainable construction will work better for the construction industry?

22. What do you think various stakeholders can do to improve sustainable construction in practice?

23. What do you think about the local government professional team being an active enforcer of sustainable construction and building regulations as stipulated by the Building code? Do you think they have been active in the performance of this duty?

24. Closing points, any advice on the way forward??

Thank you all for sparing time out of your busy schedules to make this meeting possible. I wish to thank you for enriching our insights with your wealth of experience. I have gained a lot which will help in compiling data for this research.

APPENDIX D- QUESTIONNAIRE   TEMPLATE (Final Draft)

SCHOOL OF ENGINEERING

LETTER OF INVITATION FOR A RESEARCH SURVEY.

Dear Sir/Ma,

You are invited to participate in a research study titled **''Effects of Construction Policies on Sustainable Construction towards Developing a Framework for Developing Countries''**. The study is a doctorate project being undertaken at the university of KwaZulu- Natal, South Africa.

The purpose of this survey is to identify significant factors that can improve the sustainable construction practices in developing countries. The research work involves the validation of a conceptual model using data collected from field professionals in the construction industry in Nigeria. As an experienced practising professional, you are selected to kindly participate in the study by completing this questionnaire. Please note that only professionals with more than 5 years relevant experience should fill out this questionnaire.

The survey has been approved by the relevant ethics committee of the University of KwaZulu Natal. Your participation is strictly voluntary and there are no risks involved in participating in this study. The survey collects no personal identifying information and all information collected will be treated anonymously. While there might be no personal benefits from participation, the study may benefit the industry and developing countries seeking to implement sustainable construction practices.

The survey will take about 15 minutes to complete and you are kindly requested to answer all questions honestly.

Should you require any additional information, kindly contact the addresses listed below.

Thank you for your time and dedication.

Sincerely,

Mr. Anthony Ayotunde Babalola
PhD Candidate, UKZN
Tel: +27 67 081 5073 (South Africa)
     +234 703 257 4570 (Nigeria)
Email: 218056620@stu.ukzn.ac.za

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Industry Survey Sample Questions

SECTION A: DEMOGRAPHIC INFORMATION

Please, place an X in the appropriate box or fill in the blank space when answering the following questions.

1. Gender   Male ☐   Female ☐

2. Profession   Architect ☐ Civil Engineer ☐ Quantity Surveyor ☐ Builder ☐
   Other (*Please specify*) _____

3. Level of Education   HND/ Bachelors   Masters   PhD

4. Professional Cadre   Probationer ☐   Corporate Member ☐   Fellow ☐

5. Type of Organization Private Consulting ☐   Private Consulting ☐
   (Government)Public Consulting ☐   (Government) Public Contracting ☐
   Multi National firms ☐

6. Years of experience in the construction industry in total: _____ (*Please indicate*)

7. Years of experience in a Management position: _____ (*Please indicate*)

8. Is sustainability a prime concern in your organization/ place of work? Yes ☐   No ☐

9. Please indicate your level of personal acquaintance with the sustainable construction and strategies/policies?   Little ☐   Moderate ☐   High ☐

10. Please indicate your level of familiarity with the Nigerian Building Code? Little ☐
    Moderate ☐
    High ☐

Section B   *This section of the questionnaire measures the expectations from the government as the regulator of the construction industry in Nigeria. Kindly rate the level of importance to the items underlisted below using the 5- point Likert scale, where: 1 = Strongly Disagree, 2= Disagree, 3 = Undecided, 4 = Agree, and 5= Strongly Agree.*

S/N	Government as the Regulator of the Nigerian construction industry should	1	2	3	4	5
1.	Prepare sustainable building regulations and policies for the construction industry					
2	Prepare demonstration projects for sustainable research and development in the construction industry					
3	Provide participatory financial incentives such as waivers and tax holidays for implementing sustainable construction					
4	Direct optimally the use of green bonds to mainstream construction planning and works					
5	Develop a strategic agenda for improved coordination in the construction industry					
6	Close the gap between research and developments within the industry (i.e. implement research works for industry and national development)					
7	Review extant regulations to cope with current realities in the Nigerian construction industry.					
8	Improve awareness within the industry and with the end users of industry products.					
9	Ensure that building regulations are culturally enshrined in the industry through the training of professionals					
10.	Ensure compliance of practitioners with its strategic agenda for the industry e.g. through annual practice license validation.					

Section C   This section of the questionnaire measures the expectations from the government as a client in the construction industry in Nigeria. Kindly rate the level of importance to the items underlisted below using the 5- point Likert scale, where: 1 = Strongly Disagree, 2= Disagree, 3 = Undecided, 4 = Agree, and 5= Strongly Agree.

S/N	Government as a Client to the Nigerian construction industry should	1	2	3	4	5
1	Ensure all its own projects are done in line with sustainable construction trends.					
2	Ensure that qualified and informed professionals are employed on its own projects					
3	Ensure that all multi-faceted agencies and departments under it key in to the strategic agenda for the growth of the industry					
4	Ensure that all levels of government under it key in to the strategic national agenda for the growth of the industry					
5	Ensure there are motivations of other project offers to the team who is in tune with sustainable construction practices					
6	Lead the process by ensuring that the minimum quality standards are complied with					
7	Ensure that sustainable construction inputs and deliverables are enshrined from the conceptual stage to the delivery stage of project delivery					
8	Advance sustainable construction byelaws for areas of strategic interests and cities.					
9	Culturally integrate sustainability into client's requirements as this will promote client satisfaction and sustainable construction practice					
10	Introduce retrofitting and deconstruction initiatives and policies as against hitherto unsustainable practices through client requirements and specifications.					
11	Ensure that markets for green and sustainable products boom in the construction industry					
12	Ensure that the approval process for construction works is harnessed and simplified.					

Section D   This section of the questionnaire measures the expectations from the industry stakeholders in the Nigerian Construction Industry. Kindly rate the level of importance to the items underlisted below using the 5- point Likert scale, where: 1 = Strongly Disagree, 2= Disagree, 3 = Undecided, 4 = Agree, and 5= Strongly Agree.

S/N	Towards improved sustainable construction practice in Nigeria, Stake holders should	1	2	3	4	5
1	Facilitate industry synergy among the professionals, the contractors and the academia involved with construction in Nigeria					
2	form a construction board for improved coordination among stakeholders within the construction industry					
3	Keep a database of contractor's registration and capacity improvement					
4	Ensure the board is an all stakeholder avenue to advance knowledge on all fronts within in the industry.					
5	form an all-inclusive Green building council for the furtherance of sustainable construction initiatives					
6	Harmonize all construction documents towards improved delivery of the government agenda					
7	Improve skills development and technology incubation centres for sustainable construction practice in the industry					
8	Ensure Professional member's compliance with industry statutes on sustainable construction delivery.					
9	Reorient the Nigerian construction industry towards being agenda driven not individually profit oriented.					
10	Culturally enshrine sustainable construction practices in the industry through the academics.					
11	Bridge the gap between research and practice of sustainable construction in the industry.					
12	Train the trainers through effective industry oriented Continuous Professional development programs					

Section E   ***This section of the questionnaire measures the challenges perceived in the implementation of the Sustainable construction agenda in the Construction industry.***
Kindly rate the level of importance to the items underlisted below using the 5- point Likert scale, where: 1 = Strongly Disagree, 2= Disagree, 3 = Undecided, 4 = Agree, and 5= Strongly Agree.

S/N	To effectively implement improved sustainable regulations in the construction industry, it is important	1	2	3	4	5
1	Stakeholders understand the strategic importance of public policy in relation to sustainable construction to implement the policy					
2	To have an integrated approach to implementing sustainable construction regulations to give better outcomes					
3	To utilize Local governments and municipalities in ensuring sustainable construction practices as they are closer to the people.					
4	Local governments and municipalities are utilized to ensure awareness of sustainable construction practices as they have a wider reach					
5	Municipalities embrace local needs and diversity in the practice of sustainable construction.					
6	Having trained construction professional staff on sustainable construction imperatives at the local government levels.					
7	Monitoring of projects by the professionals at different stages as advised by the Nigerian building code					
8	National programmes on sustainability adequately key in to state and local/ municipal planning for public and private construction works					
9	At the local level, stakeholder participation and input are essential to ensure sustainable construction policy legitimacy and success					
10	The need for sustainable policy feedback, improvement and evaluation mechanisms is essential to improve implementation in the long run.					
11	Keep the details simple to facilitate easy understanding of sustainable construction expectations from clients and end users					
12	The professionals expected to monitor the process synergise effectively during the implementation to ensure success					