
Evaluation of Sustainable Procurement Strategies in the Nigerian Construction Industry

Master Thesis

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[Copy of proposed conceptual formulation]



**International Master of Science in Construction and Real Estate Management
Joint Study Programme of Metropolia Helsinki and HTW Berlin**

Date: 23.04.2021

Conceptual Formulation

Master Thesis for Ms. Oluwatoyin Faith Komolafe

Student number: 2008618

**Topic: Evaluation of Sustainable Procurement Strategies in the Nigerian Construction
Industry**

INTRODUCTION

The selection, appraisal, and performance of suppliers for engineering, urban planning, architecture, and similar services are of vital importance for sustainable procurement. According to Berry (2011), the world's population is rapidly increasing and this means that more homes, schools, workplaces and infrastructure will be built. This also means that several natural resources such as oil, water, minerals will be needed to meet this need. However, these resources are taken for granted and might be in short supply in the future. Procurement officers have a very important role to play in ensuring that a sustainable building is successful through cautious selection and contracting of both the building design and construction team. There have been several studies on sustainable procurement concerning different parts of construction, but this is an uncommon topic in developing countries, especially in Nigeria. Traditionally, the construction industry is fixated on reducing the investment costs of building projects without jeopardising quality, but fewer actions are taken towards maximising the building's value over its service life (Huovila et.al., 2018). Sustainable procurement comprises of procuring environmentally friendly materials which include both natural and recycled materials. In procuring these materials, a good design that gives the best energy efficiency should be taken into consideration (Kubba, 2010).

Today, the environment globally is in a worse state with the construction sector being the most influential to the worsening situation. The depletion of the non-renewable resources used in construction and global warming has been a major concern (Ali Khan, 2018). Sustainable procurement help achieve the successful completion of sustainable buildings and this start from establishing clear objectives for the desired results, expected performance, and value, as well as characterizing the budget and environmental constraints. An optimal solution is rarely achieved by introducing green technologies after completing a building because it will turn out to be more expensive than a building designed to be sustainable from the beginning (Huovila et.al., 2018). This is where a sustainable procurement strategy comes in considering the timeline of the project,



adequate funding and budget, the expected risks and opportunities, and other relevant factors. Decisions as to how the project progresses can then be made. This study will also evaluate the construction of cost-effective and sustainable buildings in a developing country like Nigeria using sustainable procurement.

RESEARCH QUESTIONS

- 1) What are the challenges faced by construction companies in introducing sustainable procurement to their business?
- 2) What are the factors that influence the decision of procurement officers during purchase?
- 3) How can risks be measured for a tender/contract?
- 4) What purchasing policies can be adopted by construction companies in Nigeria?

METHODOLOGY

- 1) Internet-based research will be done to get information from published academic reports, conference proceedings, journal articles, etc.
- 2) Well-structured questionnaires will be made and sent to key professionals (Project managers, Engineers, Quantity Surveyors, and/or potential suppliers) in different construction companies in Lagos, Nigeria.
- 3) Parameters received will be analysed subsequently and compared to the information in the literature review.

TIME SCALE

The time frame will be within the period allowed until the final submission of the thesis. However, all reviews, questionnaire administration and analysis of data will be concluded as follows:

S/N	ACTIVITY	START DATE	END DATE
1	Conceptual formulation final draft	March 2021	June 2021
2	Literature Review	June 2021	December 2021
3	Quantitative data gathering	June 2021	March 2022
4	Thesis 1st draft	March 2022	May 2022
5	Thesis 2nd draft	May 2022	June 2022
6	Thesis final submission	June 2022	July 2022
7	Presentation/examination	July 2022	September 2022

RESOURCES

Due to current restrictions, the research will be internet-based and most of the resources will be accessed through the internet (e-library, google scholar). The questionnaires will be sent to responders via email and if a supplementary interview is necessary, it will be done through internet video calls (Skype, Zoom, etc.) Hence the cost of travelling to Nigeria will be averted.



- Ali Khan, M W et.al (2018) Green Procurement in Construction Industry: A Theoretical Perspective of Enablers and Barriers, MATEC Web of Conferences 203, 02012
- Berry, C and McCarthy, S (2011) Guide to sustainable procurement in construction, CIRIA C695, p5-9
- Huovila, P et.al (2018) Guidance Document on Procuring Sustainable Buildings and Construction, United Nations Environment Programme, p6-9.
- Iles, D and Ryall, P (2016) How Can the United Kingdom Construction Industry Implement Sustainable Procurement Strategies? In: P W Chan and C J Neilson (Eds.) Proceedings of the 32nd Annual ARCOM Conference, 5-7 September 2016, Manchester, UK, Association of Researchers in Construction Management, Vol 2, 1121-1130.
- Kubba, S (2010) Defining "Green" and "Sustainability" *LEED Pract. Certif. Accred. Handb.* 1-18



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Eric Pollock

Signature of the Supervisor

Abstract

The Nigerian construction industry contributes mainly to the country's development and as such construction processes must be sustainable to create a healthy place for all. One process that majorly contributes to the success of construction projects is procurement. Procurement is important throughout every phase of a construction project from design to construction and this is why sustainability must be introduced into the process. This study sheds light on the current procurement methods in Nigeria and evaluates the current sustainable procurement strategies. Obstacles construction companies encounter, risk measurement in tenders/contracts, factors influencing the decision of procurement officers during purchase and policies that can be implemented by construction companies in Nigeria are all objectives of this research.

The research started by studying the concept of sustainability, sustainable construction and sustainable procurement, both generally and in the Nigerian context. Procurement policies in Nigeria, transition models for sustainability and change theories have also been studied. Three case studies of different projects and an analysis of the questionnaire that was distributed to different construction professionals in Nigeria gave the author more insights on the topic.

The research indicates that sustainable procurement is pivotal in the successful completion of a sustainable construction project which is achievable although the current situation says otherwise. Findings from the questionnaires reveal that even though some construction professionals claim to understand sustainability, in practice this is not the case. Outcomes from the case studies reveal that sustainable procurement is possible in Nigeria and more awareness on the topic is required.

Keywords: Sustainable Construction, Sustainable Procurement, Construction Industry, Strategies, Policies

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List of Abbreviations

BOQ	Bill of Quantity
BPP	Bureau of Public Procurement
CBN	Central Bank of Nigeria
DBMF	Design, Build, Maintain and Finance
ECI	Environmental Cost Indicator
EIA	Environmental Impact Assessment
EMAS	Economically Most Advantageous Submission
EPD	Environmental Product Declaration
FCT	Federal Capital Territory
FEPA	Federal Environmental Protection Agency
GDP	Gross Domestic Product
HSE	Health, Safety and Environment
HVAC	Heating, Ventilation, And Air Conditioning
ISO	International Organization for Standardization
LCA	Life Cycle Analysis
LGA	Local Government Area
MEAT	Most Economically Advantageous Tender
NPE	National Policy on the Environment
PPA	Public Procurement Act
QA	Quality Assurance
RFI	Request for Information
RWS	Rijkswaterstaat
SAA	Schipol-Amsterdam-Almere
SBD	Standard Bidding Document
SC	Sustainable construction
TBL	Triple Bottom Line
TQM	Total Quality Management
UNEP	United Nations Environment Programme
WCED	World Commission on Environment and Development

1. Introduction

1.1 Background

Sustainability has grown to be a very important term in the building industry in recent times. For example, the United Nations has raised awareness on the need to decrease the negative potential environmental impacts on development and society as a whole. The pursuit of a long-term development plan through the procure and grant process ensures both the environment, community, and the social conditions of people are put into consideration for sustainable procurement. The major stakeholders such as the practitioners and academia are concerned with how business affects society, the environment, and the economy in recent times (Walker & Phillips, 2009). Organizations have been pushed to do so by the need to comply with environmental legislation, reduce expenses through whole life costing, manage supply chain risks, and maintain a good reputation in the community.

The selection, appraisal, and performance of suppliers for engineering, urban planning, architecture, and similar services are of vital importance for sustainable procurement. According to Berry & McCarthy (2011), the world's population is rapidly increasing, and this means that more homes, schools, workplaces, and infrastructure will be built. This implies that a variety of natural resources, including oil, water, and minerals, will be required to meet this need. However, these resources are taken for granted and might be in short supply in the future. Procurement officers must ensure that a sustainable building is successful through cautious selection and contracting of both the building design and construction teams. Several studies on sustainable procurement in various aspects of construction have been conducted, however, this is a relatively new topic in developing nations, particularly in Nigeria. Traditionally, the construction industry has focused on lowering project investment costs without sacrificing quality, but there have been fewer efforts to maximize the building's worth over its service life (Huovila *et al.*, 2016). Sustainable procurement comprises procuring environmentally friendly materials which

include both natural and recycled materials. In procuring these materials, a good design that gives the best energy efficiency should be taken into consideration (Kubba, 2010).

Today, the environment globally is in a worse state with the construction sector being the most influential in the worsening situation. The depletion of the non-renewable resources used in construction and global warming has been a major concern (Ali Khan *et al.*, 2018). Sustainable procurement help achieve the successful completion of sustainable buildings, and this starts from establishing clear objectives for the desired results, expected performance, and value, as well as characterizing the budget and environmental constraints. An optimal solution is rarely achieved by introducing green technologies after completing a building because it will turn out to be more expensive than a building designed to be sustainable from the beginning (Huovila *et al.*, 2016). This is where a sustainable procurement strategy comes in, considering the timeline of the project, adequate funding and budget, the expected risks and opportunities, and other relevant factors. Decisions as to how the project progresses can then be made. It is on this note that evaluating the Nigerian construction industry for cost-effectiveness and sustainable buildings becomes necessary.

1.2 Statement of the Problem

The perennial challenges to the sustainable procurement process are in relation to financial information, legal, and product quality. Inaction, conflict and meaningless formality are the major challenges to sustainable procurement. Inaction develops from the daily routine in an organization (Brammer & Walker, 2011).

The Government Procurement Department was established in Nigeria as a result of the construction sector's poor performance. The Bureau of Public Procurement (BPP) has prepared the Standard Bidding Document (SBD) to help with public project procurement. This document dealt with concerns of openness and the selection of the lowest-rated bids, but the concept of sustainable procurement was not discussed. The lack of a

sustainable concept in the BPP guide is a concern and there should be established sustainable project practices in the Nigerian construction industry.

The absence of standard procedures to set out how transparency, quality and cost can be achieved through sustainable procurement in the construction industry would lead to a varied understanding of the concept as well as varied methods in the practices. The lack of standards for sustainability implementation in Nigerian public procurement, especially after the formation of the Public Procurement Act, has necessitated a study of the state of the art of BPP application in the procurement of public buildings (Public Procurement Act, 2007). Conversely, while numerous professionals are invested in the success of construction projects, little research on sustainable procurement has been conducted in the Nigerian construction industry. As a result, the goal of this research is to assess Nigeria's long-term sustainable procurement strategy.

1.3 Objectives of the study

The research's main goal is to assess the various tactics employed in the Nigerian construction industry to achieve sustainable procurement.

The following are the specific questions that will be addressed in this study:

- What are the perennial obstacles construction companies encounter in achieving sustainable procurement?
- What factors influence the decision of Nigerian Procurement officers during purchase?
- How can risks be measured for a tender/contract?
- What purchasing policies can be adopted by construction companies in Nigeria?

1.4 Justification of the Study

Some construction companies are generally targeting a better management method for attaining and improving sustainable procurement strategies. Oyedele (2013) opined that

Nigerian construction projects experience “capital flight, capital stagnation, and capital sink”. Nigeria's construction industry is underfunded and unregulated, and the longevity of most projects is unknown. The construction industry is unorganized, unmanaged, underfunded, has a lot of lawsuits, and has a good track record in courts in Nigeria, with contractors' entry and exit on a high side. The rate is high, and the lifespan of Nigerian construction projects is unpredictable. As a result, implementing sustainable techniques in the Nigerian construction industry to develop the Nigerian construction sector is predicted to result in more effective management procedures and higher-quality project implementation.

1.5 Significance for the Research

The benefit Nigeria's construction sector has on the global climate and its effect on the environment is pivotal. Actors in the construction sector must adopt the general principle of sustainability to lessen the negative effect of the various construction work. The study focuses on how Nigeria's current construction practices are designed, built, maintained, and managed for the environment in which they are built, based on long-standing practices that are essentially unsustainable. Creating an environment constructed sustainably requires changes to both behaviour, policies and practices. Nigeria is one of Africa's fastest-growing countries and numerous development projects are underway. This presents a prospect to embark further on a sustainable development course. In theory, the concept of sustainable buildings can be implemented, but it is much more challenging to implement in practice. The task here is to create a practical approach to incorporate the principles of sustainability into Nigeria's day-to-day construction methods. In construction projects, studies on the integration of sustainability principles show that this issue is a new field and is approached from a conceptual, moral and logical perspective. However, the need to research and build realistic approaches to sustainability is not diminished. In this study, sustainable procurement strategies and the complexity associated with integrating sustainability into Nigerian construction projects are aimed at developing management and process practical methods for improving Nigerian practices.

1.6 Delimitation and Scope

1.6.1 Scope

This study focuses on evaluating sustainable procurement strategies in the Nigerian construction industry. Based on this, it exclusively considered the opinions of professionals, contractors, and consultants working in the construction business. As a result, respondents for the study were from Lagos and Abuja. The majority of the consultants and contractors are located in the north-central areas and Nigeria's largest city down south (Lagos), hence these locations were chosen. These states were picked since they are where the country's largest construction projects take place. The projects that were picked for the case study were to show the practicability of the concept of sustainable procurement.

1.6.2 Limitation

The study is only open to construction industry experts working for organizations in the study locations (Lagos and Abuja). Regardless of the respondents' categorization, consultant, or contractor, it is pivotal to know that accuracy is restricted to the respondent's perception. However, great care was taken to guarantee that the respondents were competent and experienced in procurement and its issues in Nigeria's North Central region and Lagos respectively. This study was severely limited by the lack of literature covering topics related to sustainable procurement in Nigeria. For the case study, finding a completed project in Nigeria where sustainable principles were applied from start to finish including the procurement process was challenging. The generality of the research findings was also affected by limited respondents with valid responses.

1.7 Thesis Structure

The research is split into five sections:

Chapter 1: Background information on the study was given. It defined the issues that sparked the study, highlighted some important research questions and aims, offered some suggestions, described the study's scope and limitations, and stressed the study's value.

Chapter 2: The review of relevant literature is covered in this chapter utilizing both the classic review approach and the systematic review approach. Various literature on construction, procurement, change and sustainability was examined in this chapter to acquire insight into a wide range of discussions about sustainable procurement and construction, determining what "sustainable procurement" is all about.

Chapter 3: This chapter shows the case study methodology, how the surveys were done and how the data was gathered. It covers the survey population, sample size, sample categories, and the methods involved in determining sample size and category. Projects from Finland and Netherlands were selected in relation to Nigeria. A third project was selected from Nigeria making it a total of 3 case studies. The survey focused on construction professionals in Lagos and Abuja respectively.

Chapter 4: The display and analysis of data are the topics covered in this chapter.

Chapter 5: This chapter deals with a synopsis of the main outcomes and conclusions and makes some important recommendations based on the findings and conclusions.

2. Review of Literature

2.1 Introduction

The study aims to improve Nigeria's construction industry's sustainable practices especially as it is related to procurement. The review of the literature is established on research questions with the aid of a systematic technique. The traditional approach of the review is to get a wider perspective and understanding of the subject matter, while the systematic approach is to address and review issues as raised by the research questions. The applicability of the term sustainability in construction firms will be used. Issues of the quality standard will also be emphasized to an extent.

2.2 The Concept of Sustainability

Individual actions on sustainability are exclusively on functional and value elements. Ciegis *et al.* (2015) strongly opined that context and values elements describe construction works which will later result in sustainability in the construction industry. The two-element or components i.e context and values result in motivation and improve the action of people in any organizational setting. According to Baumgartner & Ebner (2010), there are series of literature on sustainability with variation in connection to values and perspectives on sustainability. Also, according to Ciegis *et al.* (2015), the topic has been subjected to many recent debates in recent times. Carew and Mitchell (2008) opined that sustainability is attributed to value-based assumptions which add to the different approaches to sustainability. Williams & Millington (2004), recognized the evolution of sustainability concerning various literature reviews. The World Commission on Environment and Development (WCED) was given charge of developing strategies to address resource depletion issues during the early 1970s era of human effect on the natural environment. In reality, the challenge of coordinating supply and demand to meet social needs characterizes what the method of sustainability implies. Nonetheless, this problem can be approached in a variety of ways, leading to a variety of "sustainable

development" implications that have been debated. Sustainable development can be addressed from various perspectives including "weak," "moderate" and "strong," sustainability (Hopwood *et al.*, 2005; Ciegis *et al.*, 2009).

"Weak sustainability" proponents believe that nature is largely viewed as a way to achieve human-dominated rights and that economic growth and development are good gauges of achievement. As a result, extending the resource pool through the development of renewable resource alternatives and the innovative use of current assets will unravel the difficulty of asset exhaustion. On the other hand, "strong sustainability" theorists think that the Earth's resources are finite, making it difficult to avoid jeopardizing the future except a new approach is taken to the demand side of the equation. It underlined the importance of minimizing human demand on Earth's resources, as well as the relationship of humans with the environment in initiatives' development (Williams & Millington, 2004).

From the aforementioned viewpoints, there is an emergence of other opinions and definitions for sustainability. Presently, over 100 meanings of "sustainability" are available (Berardi, 2013). The 'Brundtland Report' is largely regarded as the most authoritative definition of sustainable development. "A development that satisfies current needs without endangering future needs" defines "Sustainable development" (WCED 1987, p. 37). Due to its ambiguity, however, there are differences in how this notion is understood and applied. It does not define society or how everyone must work to be sustainable. In recent years, many interpretations of the Brundtland / WCED definition have evolved, which are commonly referred to as the strengths of the notion of sustainability. Multiple conceptualizations of sustainability provide a mechanism that reaches out to various stakeholder positions because sustainability is multifaceted and often value-based (Ciegis *et al.*, 2009; Berardi, 2013).

"Sustainability" means the harmony or balance of social, economic, and environmental challenges in today's world (Berardi, 2013; Silvius *et al.*, 2013). Ignoring these variables can lead to disaster. This is typically the case since it puts sustainable practices at risk (Ciegis *et al.*, 2015), and most initiatives and activities have a defined purpose that involves exchange. Carew & Mitchell (2008) define sustainable development as a geometry that encompasses 3 key areas: social, economic, and environmental

sustainability. Rather than focusing on long-term analysis, this interpretation focuses on effect assessment (Silvius *et al*, 2012). Issues defining sustainability include complexity, equity, efficiency, ethics and values, social, economic, and environmental components. The next section delves into several aspects of sustainability.

2.3 Dimensions of Sustainability

Elkington (1997) argued succinctly that the term sustainability is categorized into three different aspects including environmental, social and economic dimensions with specific attention to cultural and political dimensions of life. These are the three pillars that make up the concept of sustainability as illustrated in figure 1 below.

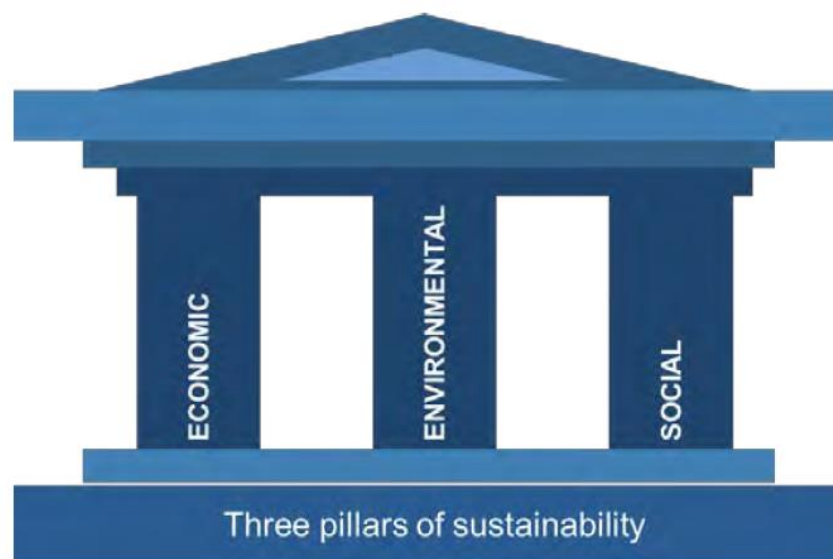


Figure 1: The Three Pillars of Sustainability (Source: World Bank, 2019)

The concept of sustainability is amendable to a singular definition. Sustainability, according to ecologists, refers to the preservation of biodiversity and the environment. Sustainability, according to economists, is defined as raising income without diminishing economic growth or future income potential. Sociologists, on the other hand, define sustainability as a type of development that protects the populace while also preserving human civil rights and impartiality (Ciegis *et al*, 2009).

Because of the concept's enormous scope, its meaning and definition are constantly evolving, since it encompasses the intricate interplay of science, politics, governance, and development. The difficulties of assessing sustainability add to the definition's complexity. The complexity and uncertainty around sustainability's repercussions are exacerbated by multiple facets of sustainability, such as social, environmental and economic concerns (WCED, 1987). However, because other viewpoints must be considered, uncertainty and disparities must be accepted. There are many parties involved in sustainability, and their expectations and interpretations of people's participation and sustainable development are sure to differ (Carew & Mitchell, 2008; Barerdi, 2013).

Three persistent impediments to comprehending and describing sustainable development were identified by Berardi (2013). According to him, it is time-based and encompasses degrees of value, space, and scale. Although Brundtland's (WCED, 1987) definition incorporates an intergenerational approach, a lengthy-term view must be taken asking how much can be seen looking into the future. The more into the future one travels, the hazier things become (Berardi, 2013; Kemp & Marten, 2007). To put it another way, what is regarded as sustainable at a particular time is based on knowledge during assessment and may turn out to be unsustainable as knowledge evolves. Sustainable approaches must be active, with adaptive workability to handle specific situations with knowledge available at all times (Berardi, 2013). Scale or spatial viewpoint has its own set of issues. Sustainability, according to Brand & Karvonen (2007), should be localized. According to Placet *et al.* (2005), greater local interpretation and application of sustainable development strategies are required rather than broad aims. However, because of the system's interdependence, local actions have global consequences; therefore, sustainability needs to be continuously assessed at multiple levels. Despite the heated discussions and ambiguity around the definition of sustainability, several fundamental features or concepts can be drawn from it. For example, Dyllick & Hockerts (2002) identified three key characteristics of company sustainability: (1) A company's corporate strategy takes into account economic, environmental, and social factors, (2) evaluates and integrates long-term and short-term perspectives, and (3) employs income rather than capital. Sustainability is defined using economic, environmental and social

aspects; short, medium, and long-term prospects; local, global and regional perspectives; and a value-based approach. The following criteria were examined to describe sustainability, based on the perspectives of Silvius *et al.* (2013).

Issues around sustainability:

- Life analysis — Considering both immediate and long-term objectives.
- Consistent preservation of resources
- The "triple bottom line" concept, considers economic, social, and environmental issues.
- Global as well as local viewpoints
- Transparency and accountability for actions taken.
- Individual ethics and worth

The term 'Triple Bottom Line (TBL)' was coined in 1994 and focuses on economic, social and environmental issues (Henriques, 2007). The TBL concept is dependent on seven sustainable revolutions which are closely linked, and transitioning might be complex to undertake (Elkington, 1997). Figure 2 below illustrates these seven sustainability revolutions and when studied intensively can be applied to any sector of an economy.

	Old Paradigm	→	New Paradigm
1 Markets	Compliance	→	Competition
2 Values	Hard	→	Soft
3 Transparency	Closed	→	Open
4 Life-cycle technology	Product	→	Function
5 Partnerships	Subversion	→	Symbiosis
6 Time	Wider	→	Longer
7 Corporate governance	Exclusive	→	Inclusive

Figure 2: The Seven Sustainability Revolutions (Source: Henriques, 2007)

2.4 Construction Industry

Construction, according to Wahab (2010), refers to the building or assembly of big structures. Irurah (2001) opines that construction can be described at four levels as shown in Figure 3 below.

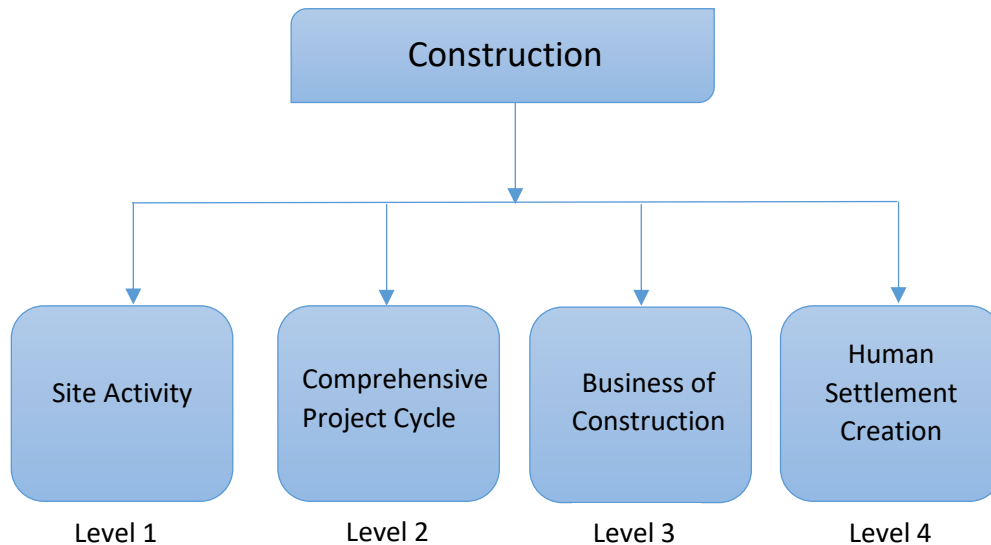


Figure 3: Four Levels of Construction (Source: Irurah, 2001)

The construction industry is a part of an economy that is necessary for growth and managing both the population's living and work settings, as well as the built environment (Ekung *et al.*, 2013). The relevance of the construction industry in economic development cannot be over-emphasized, given that it accounts for at least half of all investment in various development projects (Okeola, 2009). Against this background, the construction industry is also recognized as an important economic force. Wahab (2010) considered the construction industry to be important in the economies of all countries as it contributes to the development process. It also has many features that set it apart from other industries and emphasize the need for professional dedication.

The stakeholders of the construction industry consist of a diverse collection of professionals, subcontractors, craftsmen, workers and suppliers from inside and outside the industry (Jimoh, 2012). These are generally independent organizations with individual objectives, operational procedures, and management styles (Lædre & Haugen, 2006). As a result, a critical mass of these stakeholders is required to collectively devise more effective ways to share project and process risks, costs, and rewards. The more integrated these stakeholders are, the more likely the project will achieve successful results. Each project has its unique set of requirements and peculiarities (Oyedele, 2013),

the basic purpose is to deliver construction projects faster and improve project performance with the required quality. Unfortunately, this routine is not easy, as construction work becomes technically and administratively complex and presents some difficult technical and administrative problems (Jimoh, 2012).

2.5 The Meaning of the Term "Sustainable Construction"

Sustainable construction, together with the difficulty in interpreting sustainability and construction, has recently been the focus of significant controversy, as have various interpretations and success techniques (Berardi, 2013; Carew & Mitchell, 2008). The concepts of construction and sustainability have sparked significant debate about their scope and significance. Combining these two concepts into the new phrase "sustainable Construction" adds to the confusion (Du Plessis, 2007). There is currently no common definition for Sustainable construction (SC). According to the International Council for Research and innovation in Building and Construction (CIB), Sustainable Construction is "the sustainable production, use, maintenance, demolition, and reuse of buildings and construction or their components". The CIB went further to describe the built environment and sustainable buildings as contributions aimed at achieving components of sustainable development (CIB 2004, p. 02). This simply means that SC is the response of the construction industry to the implementation of sustainable development. A framework for sustainable buildings is needed, according to Hill & Bowen (1997), to represent a pleasant structure based on ecological values and resource efficiency. Their paradigm failed to consider the viewpoint of developing countries and that sustainable construction may not be appropriate for them. Traditional frameworks for sustainable construction pay close attention to the impact of construction operations on the environment, also viewed largely from an environmental standpoint. As more interest is paid to the impact of construction activities on the environment, energy, water, waste reduction, pollution and effective use of natural resources, are commonly viewed as indicators for assessing sustainable construction. (Kibert, 2013; Akadiri *et al.*, 2013).

However, the SC's overall goal was to "build and sustain equilibrium between the natural and constructed ecosystems," "affirm human dignity," and "create settlements that promote economic fairness" (Du Plessis, 2007). The process is stated to be incorporated. According to Berardi (2013), sustainable construction is a journey marked by time, scale, domain, and social constraints. As a result, defining an SC agreement is challenging. A balance is created between seemingly contradictory objectives like economic growth, social equality and environmental quality (Silvius *et al.*, 2013). It is used to describe these three bottom lines in many models and illustrations. It symbolizes three subsystems of three progressive rings from the perspective of the environmental system signifying the eventual limit. Silvius *et al.* (2013) described the interplay between the three subsystems. The idea is that breaking down the large concept of sustainability into three connected sub-concepts will render it more accessible to the environment.

Despite the use of these three interconnected sub-concepts to map the concept of sustainability, a comprehensive definition of sustainable construction remains elusive (Berardi, 2013; Baumgartner & Ebner, 2010; Ciegies *et al.*, 2009). As a result, some assessment techniques for determining what constitutes sustainable construction have been created and implemented (Cole, 2012). By offering a reference framework for sustainable construction practices, these rating systems have helped raise awareness of sustainability goals and standards (Berardi, 2013). Construction companies are being pushed to implement proactive, long-term plans throughout the development process as a result of these criteria (Akadiri *et al.*, 2012). However, these standards are confined because they are mostly concerned about the environment instead of social reliance (Silvius *et al.*, 2013; Berardi, 2013). Multi-scale impacts, Long-term evaluations, and multi-domain criteria are all part of the emerging sustainable construction paradigm, which exemplifies a substantial step ahead of the traditional approach to sustainable buildings. A generally recognized and agreed-upon definition of sustainable buildings is required. However, this failed because the concept was repeatedly scrutinized from several perspectives (Cooper, 2006; Du Plessis, 2005). Different explanations identify the various elements that make up the idea of sustainable construction.

2.5.1 Characteristics of Sustainable Construction

Various components to a long-term structure exist, each with its own set of definitions. These components are called dimensions. Sustainability is defined mainly from all environmental perspectives. Perceptions of several other authors, who saw sustainable construction and strong environmental procedures in the management of construction have been influenced by this. Understanding concepts has improved dramatically over time. SC, according to most experts, goes beyond addressing the issue of limited resources and environmental sustainability management. The ideas of sustainable development are applied to sustainable structures. This necessitates considering the different aspects of long-term sustainability. According to the literature, some scholars have taken into account a variety of other aspects, including political, cultural, business, and moral concerns (Pawlowski, 2008; Du Plessis, 2007). Inferences about these aspects or dimensions are based exclusively on priority issues. The majority of the research bases the identification and selection of specific elements on developmental priorities in the context of learning.

According to Du Plessis (2007), sustainable construction should embody the following characteristics:

- A broad description of construction as a "cradle to grave" process encompassing many more participants than only those who are typically associated with the construction industry.
- Place a strong emphasis on improving both the quality of life of individuals and communities while also protecting the environment.
- Consider non-technical issues of social and economic sustainability in addition to technological ones.

2.5.2 The Practice of Sustainable Construction

The housing circumstances that enable humanity to thrive and evolve on our planet are provided by the construction sector (Zhang *et al.*, 2011). Around 5-7% of GDP in most

countries is accounted for by the construction sector, employing several people in various positions, and promotes economic advancement. Architecturally, this can have a variety of negative consequences. Construction consumes mainly non-renewable and natural resources generate vast quantities of waste and contribute around 30% of world energy consumption (Kenny 2007, p. 1). It also causes about 40% of global carbon dioxide emissions as illustrated in Figure 4 below (Ahmed Ali et al., 2020).

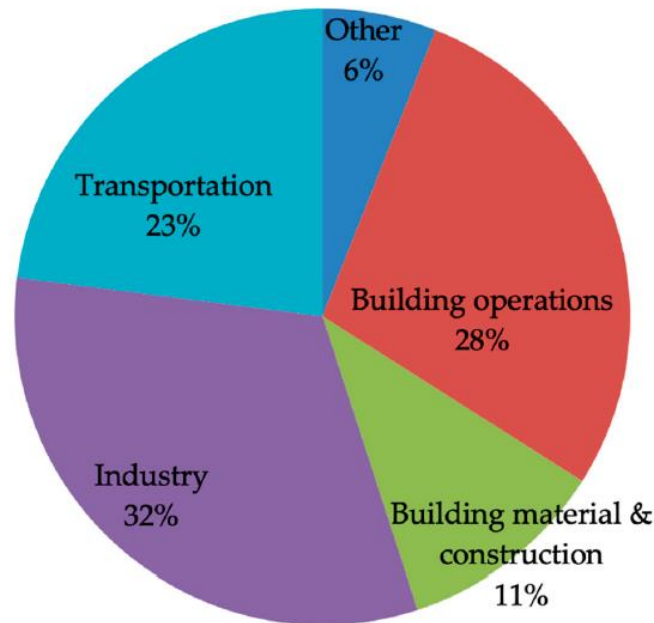


Figure 4: CO₂ Emission according to different sectors Globally (Source: Kenny 2007, p. 2)

To limit the negative impact of their operations, the construction industry must incorporate sustainable solutions into their building processes (Akadiri *et al.*, 2013). To evaluate what constitutes sustainable building practices, a variety of assessment methodologies have been created (Cole, 2012). Current assessment systems available range from life cycle assessments to energy evaluations to sophisticated quality management systems (Berardi, 2013). Because different building materials are evaluated independently before being designated a real building, a multidimensional approach is also recommended.

The majority of current grading systems, on the other hand, prioritize energy efficiency and environmental issues, with social aspects of sustainable design receiving minimal consideration (Dempsey *et al.*, 2011). Designs that promote social sustainability must

uphold ethical standards throughout the supply chain, offer a secure and healthy work environment, and protect culture and history. This concept for sustainable construction has been explained by the International Council for Research and Innovation in Building and Construction (CIB, 2010). According to the interpretation, the following new sustainable construction practices principles have been established:

- Using general sustainability concepts to promote continuous process improvement, equality, universal reasoning, local behaviour, rational view, long-term prevention and risk evaluation, responsibility, and transparency.
- Involve all stakeholders in the design, construction, and maintenance processes through a collaborative approach so that the individual and communal social requirements of residents may be addressed.
- To improve stakeholder satisfaction, fully integrate with important regional plans and infrastructure, as well as a link to existing systems, networks, and urban and suburban networks.
- Modelled with the life cycle in mind, consider all previous stages, such as designing, construction, operation, maintenance, refurbishment, and final disposal, while evaluating the performance of each phase.
- Minimize environmental impact throughout the product's lifetime (estimated or remaining). Needs on a global and regional scale, resource effectiveness, waste reduction, and emission reductions should all be taken into account.
- Take into account future operating, maintenance, rehabilitation, and disposal costs to give a long-term economic benefit.
- Give long-term social and cultural value. Structures that are both sustainable and functional should give people a sense of place and belonging.

2.6 Nigeria's Construction Practice

Nigeria is a Federal Republic located in the western region of the continent of Africa. It shares borders with Cameroon and Chad on the eastern side, the Republic of Benin on the western side, Niger to the north and the Atlantic Ocean/Gulf of Guinea to the south (see Figure 2 below).



Figure 5: Geographical Location of Nigeria (Source: World Atlas, 2021)

Nigeria sits on a total area of 923,768.00 km², land and water inclusive and the total population is estimated to be over 200 million (World Atlas, 2021). The graph in figure 3 below shows the fast growth in the country's population.

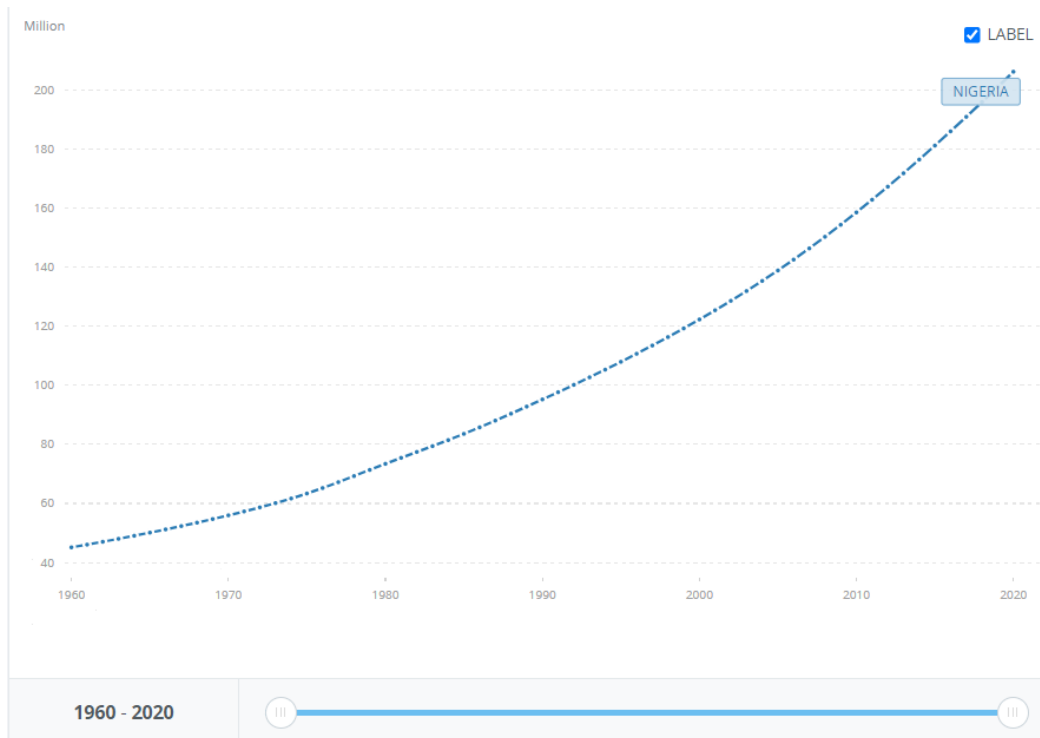


Figure 6: Population Growth of Nigeria between 1960 and 2020 (Source: World Bank, 2020)

Nigeria can be characterized as the most populous country on the continent of Africa. The capital of Nigeria is the Federal Capital Territory (FCT) located in Abuja. The country has 36 states plus the FCT, six geopolitical zones, a total of 774 Local Government Areas (LGAs) and over 274 ethnic groups (Ahiakwo, 2014).

The above statistics show that Nigeria is one country with major developmental milestones and several potentials. The increasing need for structures and infrastructure in Nigeria prompted the establishment of construction contracts and the launch of operations by several British and Italian businesses in the late 1940s. The demand for construction activities expanded even further when Nigeria gained independence in 1960, overwhelming most construction enterprises. The construction industry experienced a massive boost in the 1970s in demand for buildings and infrastructure after finding oil in Nigeria. Unfortunately, building methods and standards deteriorated significantly during this time. Projects are badly planned, underdeveloped, and implemented, with huge cost overruns, poor quality, and widespread abandonment. The National Labor Council proposed a return to the direct labour system for capital projects in 1984 because of

extensive contract misuse. This method initially improved the way projects were carried out, but it was later exploited in some instances of setbacks and overrun of costs (Mbamali & Okotie, 2012).

The problems in the Nigerian construction sector are not only related to how projects are carried out. It has to do also with the performer's professionalism, management, and technical talents. Traditional architectural processes in Nigeria involve three stages, the first of which is concept and design. The construction phase is an ongoing phase. Finally, there is the operation phase. The public sector is a key consumer of Nigeria's construction industry, which completes projects in two stages, with two different construction and design teams. The design team consists of in-house specialists or consultants like architects, structural engineers, surveyors, as well as service engineers, whereas the building team consists of the prime contractor and subcontractor chosen upon completion of the design in the course of the bidding process. Integrated design is not supported by this technique because building knowledge is not incorporated into the process of design and there is a vacuum between design and the completed project, and project execution is delayed (Ogunsanmi, 2012).

However, the National Housing and Urban Regeneration Agency of Nigeria did not begin enacting the National Building Criteria Act until 2006, which set minimum standards for preliminary design, building, and post-construction operations. Building and construction standards did not exist. The construction and project execution quality had been poor up to this point. Building codes were created to ensure the construction industry's quality, safety, and capacity. However, putting the Building Standards Act into effect was a difficult undertaking.

2.6.1 The Nigerian Construction Industry and Sustainability

When attempting to explain sustainable development in Nigeria and Africa in general, and its consequences, it is critical to understand the development priorities and cultural backdrop of construction on the continent of Africa. Poverty, growing urbanization,

institutional weakness, instability, and a network of resource constraints are among Africa's main development concerns (Du Plessis, 2007). Africa is perhaps the world's most urbanized continent, particularly in Nigeria, where fast population growth has exacerbated development constraints increasing the competition for limited resources. It is vital to consider the country's unique physical and socioeconomic factors while discussing sustainable construction in Nigeria. According to Du Plessis (2007), African and Western world perspectives on sustainable construction tend to diverge. Africa's priorities for energy efficiency especially emissions of CO₂ emissions, and indoor atmosphere are low. Policies established by Government for housing, economy, space planning and environment have been identified as factors influencing the development of sustainability in Africa and other rising countries, and this concept has directly impacted the construction industry. Issues such as poverty reduction, employment development, capacity building, and quality assurance, among others, are addressed by these policies. However, it is highly controversial whether the method of implementing these guidelines will improve the goals of sustainable construction.

Sustainable construction in Africa, according to Adebayo (2002), is crucial to more sustainable growth, but it has not gotten enough attention. Sustainable building is relatively a recent idea among professionals in Nigeria. Recently, several summits for stakeholders have taken place, and the "Green Building Council" is now being formed, even though Nigerian stakeholders' awareness and understanding of building sustainability remain low. According to Dahiru *et al.* (2014), the most pronounced factor is that beneficial and sustained sustainable practice in Nigeria, as well as following instructions and laws, are insufficient. Some research has found that there is a need for additional information on sustainable components and solutions (Adebayo, 2002). Sustainable construction knowledge and awareness play an important role in documenting construction tasks that have knowledge and awareness levels. In Nigeria, knowledge and awareness seemingly have an impact on the embracement of sustainable practices.

2.6.2 Nigerian Laws and Regulations on Sustainable Construction

Regulation plays an important role in directing construction activities. However, introducing sustainable practices into the Nigerian construction industry appears to be difficult due to the implementation of legislative rules relating to sustainability. Effective monitoring and regulatory compliance, according to Nwokoro & Onukwube (2011), are critical for attaining sustainable construction. Several rules and regulations exist in Nigeria to safeguard the environment and promote environmentally friendly building practices. These include, for example, Environmental Impact Assessment Directives, Safety and Health Acts, Federal Environmental Protection Acts, and Domestic Labor Acts. However, there are concerns about the agency's ability (both technical and financial) to effectively implement these guidelines. Enforcing these commendable legal provisions is a major challenge.

According to Babatunde & Low (2015), Nigerian construction industry players suffer issues as a result of insufficient regulation and policy execution. This has an impact on firms and building professionals adopting sustainable methods. According to Nwokoro & Onukwube (2011), the Federal Ministry of the Environment controls and manages general environmental regulations in Nigeria's building environment. The Federal Environmental Protection Agency (FEPA) Act on the Environment, the 1992 Environmental Impact Assessment (EIA) Act and National Policy on the Environment (NPE) are all included. The primary goal of these rules is to make sure that any environmental impacts coming from construction projects are anticipated and treated before the project commences. It entails a methodical approach to identifying, forecasting, and evaluating a development project's possible environmental impact. However, despite detailed guidelines and a strong legal foundation, Nigeria's environmental laws have yet to be fully developed as many of them fail at the implementation phase. Ogunba (2004) noted that contemporary EIA methods in Nigeria had obvious flaws, but that the system's principles, rules, and policies were inherited from the established Western EIA system. It is especially vital to reconstruct the EIA system controlled by city planners for it to flourish favourably like other

systems. Several EIA systems are operating in Nigeria such as the 1992 EIA Act which is modelled after the U.S. Environmental Protection Act for the commercial sector.

Ogunba (2004) found that the diversity of Nigeria's EIA system represents an uncoordinated attempt by local policymakers to emulate the diverse EIA developments of the United Kingdom and the United States. According to the research, using numerous independent EIA systems at the same time in Nigeria causes excessive duplication and fails to achieve best practices. Likewise, practically all of Nigeria's health and safety regulations have been imported from elsewhere. The 1970 Occupational Safety Act, for example, began in the United States (Idoro, 2008).

2.7 Management of Construction Quality and Sustainability

Quality is defined as "fulfilling requirements," which is included in international quality standards (ISO 9001:2008) (Crosby, 1980). The notion of quality is highly debatable because it encompasses both explicit and implicit requirements. Others see quality as a category of performance, but Idrus & Sodangi (2010) see it as conformity with defined requirements and fitness for purpose. Construction quality, according to Srdic & Selih (2011), encompasses process and product capabilities that fulfil defined standards, and quality must be evaluated at three levels: project (structural), process, and construction product. Quality is an interdisciplinary notion that may necessitate multiple ways of evaluation (Hillman Willis & Willis, 1996). Quality considerations must be a significant factor in building procurement processes to reach or improve the desired standards. Quality performance is evaluated in connection to the dimensions of the products, processes, and product components of the project execution in this study. McCabe et al. (1998) opined that Inspection is one of four primary stages of quality control that was discovered. He claimed that Total Quality Management (TQM) and Quality Assurance (QA) attempt to improve the project's process and deliverables by reducing the occurrence of problems and, ultimately, avoiding them.

According to McCabe (2014), quality assurance is frequently conducted by the overall management of the entire project. It can be carefully managed, but it can also be explained as a typical transition period. Organizations must begin with their processes to establish TQM (Dale & Cooper, 1994). TQM, according to Tari & Molina-Azorín (2010), encompasses not just product quality but also behaviour. It provides an opportunity for people to work together more effectively and create ways to produce quality results each time with a continuous desire to improve. Some companies have tried to introduce TQM, but they have not succeeded. According to Zink (2007), most companies' TQM efforts failed because they concentrated on the quality of the product rather than grasping why a basic cultural shift is necessary for the achievement of TQM.

Construction quality performance can be measured at two levels: project and enterprise. Physical structure creation takes place at the project level, and these procedures are part of business practice and ethos (ISO 10006, 2003). Some tools and procedures for quality improvement specified at the organizational and project levels might help to assess and evaluate a project's performance level. Table 1 shows the quality parameters for construction work developed by Srdic & Selih (2011).

Performance of construction projects (Quality of structure)	The extent to which quality is met throughout the project life cycle. This encompasses design, execution, component, and product quality in relation to drawings, specifications, and applicable rules/standards.
Construction process performance (Process level)	Design, planning, and building processes are carried out with managerial and technical competency skills, integrity, and promptness.
Construction product (component) performance	Identifying and selecting items for the building industry. Complete adherence to all applicable quality and sustainability standards.
Design Quality Practices	A systemic framework for assuring the quality of quality-related actions and assessing how successfully they are carried out. This is seen in the organizations' quality management methods.
Total Quality Systems	A systemic framework for planning actions linked to quality and assessing how well they are carried out.

Table 1: The Construction Quality Dimension (Source: In conformity with Srdic & Selih, 2011)

The most important quality requirements in a construction project are the finished building's usefulness, durability (structural), and attractiveness. This ensures that the design and construction satisfy applicable standards, that the components meet applicable specifications, and that the execution of construction work is done according to those requirements. This is linked to specific stakeholder requirements as well as the attainment of standard project goals like quality, money, and scope.

Srdic & Selih (2011) provide a cost-effective way to increase project sustainability by including sustainability performance assessments into quality standards while meeting the project's objectives. The duo discovered that it represented a high-level management strategy. The Environmental Product Declaration (EPD) is the main strategy for achieving a better environmental performance of products, notably building items, in the European Union. The ISO 14025:2006 and ISO 14043:2000 documents provide reliable information on a product's environmental impact, allowing the contractor to select the most environmentally-friendly choice. Srdic & Selih (2011) provide an integrated quality and sustainability performance evaluation model based on EPD as well as a quality compatibility technique for improving building sustainability in their paper. This technique integrates sustainability assessments and quality at the levels of the building project and project process levels. At the organizational and project levels, this means combining a well-recognized system for quality management including traditional environmental management procedures, as well as adhering to EPD at the product level and procurement levels. When the TQM concept is implemented, corporate sustainability founded on a stakeholder model and total quality management (TQM) are inextricably linked, and sustainability is TQM's future-oriented notion (Zink, 2007).

2.8 Procurement in Construction

The United Nations Environment Programme (UNEP) defines procurement as a method through which private or public institutions purchase goods and services to meet a range of demands, such as those for infrastructure, transportation, and housing. Procurement is more than just buying products and services. Timeliness, efficacy, efficiency, competition,

transparency, equitable distribution, and development are all requirements of procurement (UNEP, 2021). Procurement refers to the procurement of project resources to get the constructed facility (Walker & Rowlinson, 2008). Real Estate Development Procurement is an activity where buildings and land are acquired in the best possible way, considering the overall price, quality, time and sustainability (Adenuga & Dosumu, 2012). According to David et al. (2009), the procurement system takes into account culture, governance, management, economics, the environment, political and ethical concerns, including contract strategy. Ojo & Aina (2010) feel that selecting the appropriate procurement alternatives for the implementation of a construction project is critical, as it does not only contribute to project success but does consider other elements. According to Zhyzhneuski (2014), the construction industry is a very conservative type of industry, adopting a well-known traditional business approach, including the procurement process.

The general performance of a project hangs on choosing a proper technique to manage the overall construction project execution process. Even seasoned customers could be unaware of all the likely benefits and downsides related to each procurement system, making it difficult to choose the best procurement technique (Tookey *et al.*, 2001). Consequently, a detailed analysis of intricate and dynamic factors including efficiency, cost certainty, adaptability, responsiveness, flexibility, as well as other related characteristics is part of the procurement selection process (Luu *et al.*, 2003). In response to the need to improve the implementation of building projects, many procurement strategies have been established. Procurement strategies are focused on the requirement to optimize all aspects throughout project implementation. Each project is distinct in its characteristics and requirements, and the procurement technique must consider the project's technical aspects as well as the demands of clients and contractors regarding the project (Alhazmi & McCaffer, 2000). Building procurement system has a considerable impact on the direction of a project and its performance (Rwelamila *et al.*, 2000). Inappropriate procurement procedure selection and use are part of the primary reasons for public projects' subpar performance in terms of construction sustainability. A generic procurement procedure is depicted in Figure 7 below. The steps of procurement are depicted in this illustration, along with their typical sequence.

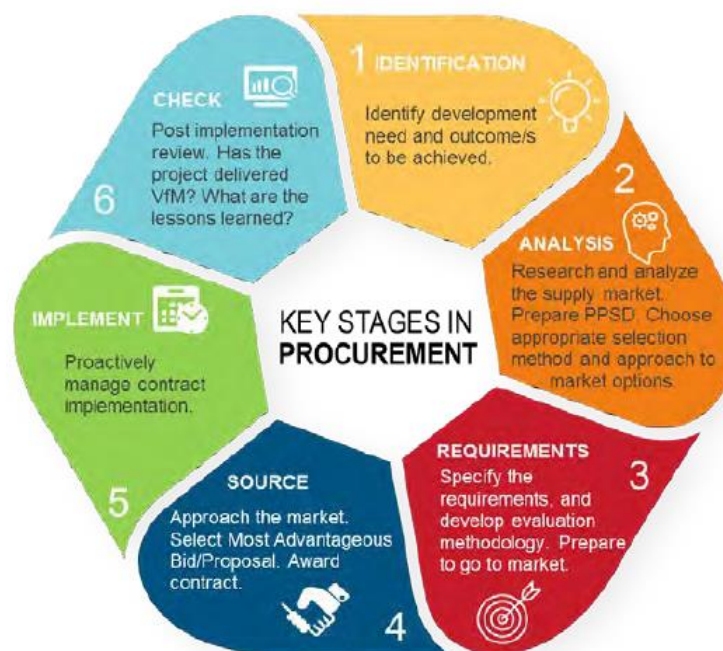


Figure 7: Key Stages in the Procurement Process (Source: World Bank, 2019)

2.9 The Nigerian Procurement Methods

Nigerian construction projects have underperformed due to poor procurement decisions and the continued use of old frameworks, particularly in the public sector (Oyedele, 2013). Traditional construction, construction management, project management, management contracts, Labor Only, partnerships, Direct Labor, joint ventures, and other procurement methods are employed in Nigerian construction projects (Ogunsanmi, 2012). The Nigerian Construction sector stakeholders believed that the passage of the Public Procurement Act (PPA) in 2007 would improve construction project performance (Ekung *et al.*, 2013). Ojo & Aina (2010) also explains that Nigerian clients and consultants do not have a specific process in choosing a procurement method to carry out a project, but rather are familiar with a specific method. Customers use procurement methods that suit their business environment. Ogunsanmi (2012) also considers the design process used in the procurement method to be a serious suspect in claim generation. The premise, according to Mbamali & Okotie (2012), is not the technique of execution chosen, but the executor's honesty, leadership, and professionalism. Other procurement methods have

also been developed domestically for better integration and overall project success. Management contracts, construction management, collaborations, and design and construction are some of the other methods (Mbamali & Okotie, 2012).

Babatunde *et al.* (2012) pointed out that traditional and non-traditional methods of procurement are commonly used in Nigeria, nevertheless, contract procurement is the most common way to organize and manage construction projects. According to their findings, the decision to use a traditional procurement approach should be based on the project's completion time and cost estimates. Quality assurance is supported by the unconventional procurement system. This strategy has been planned for separating the design and construction phases, and it may not be appropriate for all types of construction projects. According to Mohsini *et al.* (1995), traditional procurement procedures were insufficient to deal with the construction industry's organizational challenges because of the dangers connected with incorrect communication and coordination. The traditional construction procurement technique used in most Sub-Saharan African countries, according to Rwelamila *et al.* (2000), has an insufficient relationship management system for dealing with sustainability criteria and construction sustainability. As a result, a competent procurement system is required, and environmental impact assessments must be performed before planning and design.

Ekung *et al.* (2013) support this by classifying the various procurement systems used into two categories: old or traditional methods and modern methods. The following sections go over the two categories in order.

2.9.1 Traditional Procurement

Traditional procurement selects an architect or other consultant for the project design, then selects contractors, chooses a contractual relationship with the customer, and enters into a project (Ogunsanmi, 2012). All phases from design to bid to build are considered separately. According to Walker & Rowlinson (2008), traditional procurement approaches are familiar to most contractors and customers and have often become standard

approaches. Traditional procurement procedures are described by Oyedele (2013) in the following ways:

- **Direct Labor Method:** Clients search for contractors and different craftsmen, take all risks and manage cash flow.
- **Design, Bid, Build Method:** This is a linear process where one phase is completed before the start of the next with no overlap.
- **Selective bidding Method:** A new twist on the traditional method is a system where the client has its bill of quantity (BOQ) for the property, which is used to compare contractor bids. Contractors who bid 10% less or 10% higher than the booking price (customer's BOQ contract amount) will be disqualified (Oyedele, 2013). This procurement method has brought many challenges and disadvantages to all parties involved in the construction process.

In a traditional "conflict agreement", the parties are looking forward to asserting their contractual claims and protecting their contractual rights. As a result of this conflict, it can potentially significantly increase project costs and delays without realizing value (Samaraweera, 2013). This approach minimizes the opportunity to integrate construction experience into the design, delays project execution and creates significant variability between designed and completed projects (Mbamali & Okotie, 2012). Walker & Rowlinson (2008) also further emphasized that the main criticism of the traditional approach is to lead to a confrontational approach to disputes arising from changes in the treaty, imposing a strict role on all parties. In traditional procurement systems, the contractor is accountable to the lead design consultant and does not have formal direct access to the client, which compromises relationship issues.

2.9.2 Modern Procurement

According to Walker & Rowlinson (2008), the emergence of experienced and demanding customers allows industry-leading contractors to break new ground, and traditional approaches to procurement are inadequate. There is a growing awareness, the technical

complexity of building is increasing, and customers are demanding it administratively. The modern construction method is an innovative financial initiative used to carry out construction projects. They include public and private financing arrangements that are mutually beneficial (Oyedele, 2013). Using non-traditional procurement methods makes it easier for design teams to provide contractor expertise and makes it easier to engage contractors early in the design and development process (Walker & Rowlinson 2008).

The modern view of the procurement system is not based on the traditional view of the structure or legal framework, but on the issues of trust, cooperation and ethical behaviour. This paradigm shift in the procurement perspective laid the foundation for an alternative, customer-and-stakeholder-centric approach. More recent developments in the construction industry have emerged for many sophisticated (i.e., experienced in construction procurement) clients who have experimented with relational procurement approaches (Walker & Rowlinson 2008). Modern procurement forms include management contracts, construction management, design and management, and others, according to Davis *et al.* (2008). These procurement procedures have subtle distinctions:

- Under the management contract, the contractor has a direct contract with all construction companies and is accountable for all construction activity.
- The contractor is responsible for professional management, program formulation, construction and design coordination, with collaborative facilitation increasing the constructability of the project, in construction management.
- A management contract is similar to the design and management strategy. In a design and management contract, the contractor receives payment and assigns duties to the design team and the construction crew.

As Zhyzhneuski (2014) cited regarding procurement in construction, a better understanding and wider implementation of new strategies emerged in addition to the traditional procurement strategies. Such new additional strategies developed and widely implemented include,

- Procurement for design and construction

- Procurement through management (construction management, management contract)

However, Zhyzhneuski (2014) pointed out a new reality that the construction industry can be viewed as a business environment with an increasing number and complexity of new technologies, intensifying competition, more open markets, greater opportunities for cooperation, and constant financial problems, especially concerning public budgets. He led the construction industry to develop more new strategies for procurement approaches. Therefore, these newly developed strategies include prime contracts, partnerships, alliances and joint ventures. According to Awodele (2014), a joint venture can be formed, with private sector partners owning the majority of the shares. The government selects strategic partners in a competitive manner requiring bidders to carry out their initial phase of work. The following phases are handed to public sector partners; however, the initial phase is implemented by strategic partners.

2.10 Sustainable Procurement

One good news for the construction industry is the projection that the world's population will double in the next 40 years increasing the need for more buildings and infrastructure. However, the planet's resources are finite, and a lot of natural resources like water, oil, and minerals, which are carelessly being used will become scarce over the next 40 years (Berry & McCarthy, 2011). The effective and efficient acquisition of materials and services, considering the economy, society, environment and governance, best defines sustainable procurement. The concepts of sustainable procurement can be applied to public and private sectors with minor variations in techniques, goals, and outcomes. Sustainable procurement, according to the UK Sustainable Task Force report (2006), is a technique that helps businesses satisfy their demands for services, goods, labour, and utilities, maximizing value for money over time by producing advantages for the business as well as for society, the economy, and the environment while avoiding environmental harm. Long-term development necessitates sustainable procurement.

Table 2 illustrates some of the key concerns that the social, economic, and environmental components of sustainable procurement often address.

Environmental issues	Social issues	Economic issues
<ul style="list-style-type: none"> • air emissions (e.g., greenhouse gas emissions like carbon dioxide as well as other contaminants) • discharges into bodies of water (e.g. pollution caused by chemicals channels of water) • land releases (e.g. fertilizers made of chemicals) • the utilization of raw materials as well as natural resources (For example, biodiversity, and sustainable forestry) • energy usage (e.g. renewables) • water usage • emitted energy (e.g. radiation, and heat disturbance, vibration) • by-products and waste (For example, recycling and prevention of waste) 	<ul style="list-style-type: none"> • promoting a diversified pool of competitive suppliers (for example, minorities) or those who are underrepresented suppliers) • fostering justice working conditions (For example, a living salary, etc.) • avoidance of connected relationships workforce, labour diversity and equality) • enhancing the workforce (For example, health) as well as security, freedom to create a union or join one) • facilitating training possibilities and development of abilities (for example, apprenticeships) • Benefits to the community (For example, assisting) community organizations, volunteerism) • ethical and fair trade sourcing methods (For example, fair pricing policies) 	<ul style="list-style-type: none"> • generation of jobs (e.g., green technologies, developing markets for) items made from recycled materials) • total cost of ownership • maximizing the return on investment money • assisting small and medium-sized enterprises (e.g. supporting prospects for tiny businesses) • lowering obstacles to access (For example, facilitating open competition) • Ensuring smooth business operations continue to be a workable operation to generate jobs • Ensuring the reliability of suppliers that agreements are fair and competitive promoting the viability of Business.

Table 2: Some significant sustainability problems to consider (Source: In conformity with Berry, 2011)

2.10.1 Sustainable Procurement and its Benefits

Berry (2011) identified four key sustainable procurement **objectives** as follows:

- To reduce the undesirable effects of services and goods, during their time and supply.
- Saving as many natural resources as feasible.

- Ensuring that reasonable contractual rates and terms are used and followed, as well as ensuring the satisfaction of the least possible ethical, employment and human rights standards.
- Throughout the supply chain, social equality must be fostered. SMEs and non-profit organizations should be able to participate in supply chains that show the societal range and demographics being touched. Sustainable procurement should also assist in training and skill development. Finally, the reduction of bad outcomes should be the endeavour of sustainable procurement as well as encouraging positive outcomes for all.

The benefits of sustainable procurement and how to use it effectively are still being taught to the building industry. According to Ruparathna & Hewage (2015), cost savings over a long period are the main advantage of implementing sustainable procurement. Reducing the negative effects of hazardous products on the health of the public resulting in securing social benefits and protecting societal rights are additional benefits of sustainable procurement. By assessing the need to buy, reducing quantities as much as possible, preserving water and energy, promoting recycling, controlling packaging, and increasing the efficiency of transportation, sustainable procurement is intended to save cost and decrease waste (Ogunsanya *et al.*, 2019).

The following are some of the **advantages** of a sustainable procurement process:

- A strategic procurement process saves time while also ensuring that the proper solution is selected to satisfy the project's requirements.
- A competent procurement procedure aids in determining the appropriate material cost for a project.
- It is beneficial for a supplier to be conversant with a procurement entity's specific methodology.
- Good and Sustainable procurement aids in the settlement of transparent bookkeeping while also preventing fraud.

2.10.2 Strategies for Sustainable Procurement

To establish real sustainable growth, strategy selection and development must span throughout the supply chain of a company (Green *et al.*, 1996). Companies attempting to improve their environmental sustainability, might collaborate with contractors to decrease product harmfulness or ascertain the type of packing used during distribution, for example. As illustrated by a vast number of case studies on sustainable procurement, the requirement to look outside a company's perimeter underscores procurement's vital role in sustainable development. Larsen & Lomi (1999) typified procurement sustainability as a 'policy-resistant dynamical system' which focuses on strategy generation as regards making policy rather than implementation through operations. Ershadi *et al.* (2021) summarized measures to increase the effectiveness of the application of sustainable procurement in the construction industry.

- Establishing measurable goals for sustainable procurement, translating them into pointers, controls and values.
- Establishing measurable long-term procurement goals and transforming them into pointers and limits.
- Assigning tasks to each entity involved in the process of sustainable procurement and keeping track of them.
- Avoiding communication breakdowns, rework, and conflict, the task of each team member must be clearly defined.
- Exposure to past project activities' experience.
- Choosing the best feasible planning frameworks and putting them into action.
- Supporting efforts to ensure that sustainability concepts are properly integrated into supplier evaluations and tender selection.
- Ensuring that quality assurance is carried out in accordance with sustainability criteria.

The private construction sector is voluntarily implementing sustainable procurement methods, by increasing awareness of sustainability and creating additional adaptive private business rules, when considering the motivations for sustainable procurement

(Abduh *et al.*, 2018). Client acceptance and corporate clients paying more attention to their supply chains to develop sustainable strategies, according to Dobers & Wolff (2000), are propelling factors in the adaptation of sustainable procurement. Putting whole-life costing methods to good use lowers maintenance costs throughout the life of the structure (Green *et al.*, 1996). Figure 8 shows the drivers of sustainable procurement.

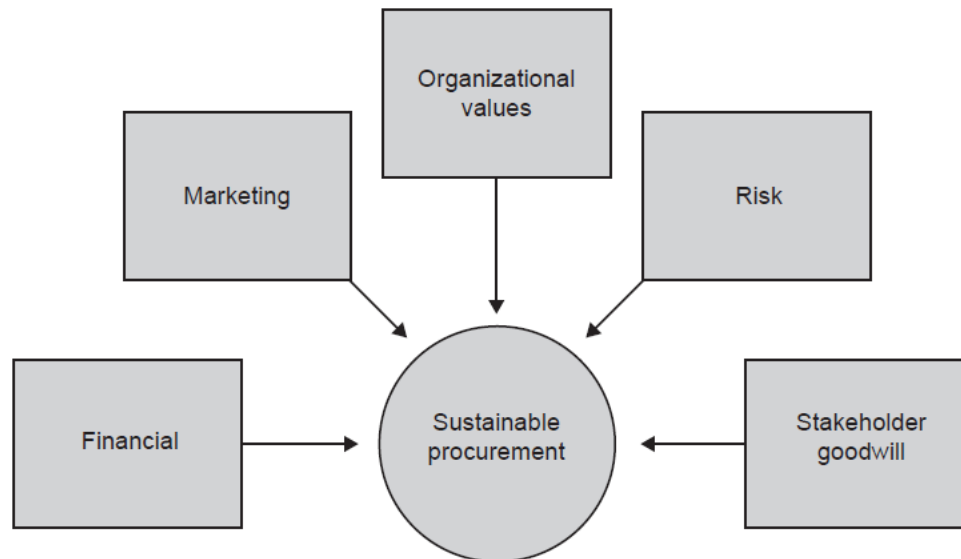


Figure 8: Drivers of Sustainable Procurement (Source: Berry, 2011)

2.11 Transition Models for Sustainability and Change Theories

Understanding change theories and transition models is important to know why the concept of sustainability might not be accepted by some groups of people. In 1951, Lewin, a social scientist, identified that an active balance of influences acting in opposing directions was “behaviour”. Around his three-step transition paradigm, several concepts arose. The first step in the transformation process is to dissolve a current position (an equilibrium). Dissolving is required to prevail over the tensions of specific resistance and collective adaptability, which may increase current driving power while decreasing binding force, both of which are detrimental to out-of-balance movements. This can be accomplished by combining the two methods. (In other words, the pushing force for change is enhanced while the binding force is reduced.) Unfreezing activities, according

to Kritsonis (2005), involve identifying problems and recognizing the need for change. Trust must be established, and the audience motivated. The goal is then brought to a new degree of equilibrium by introducing adjustments or interventions. This stage includes learning, adaptation, and collaboration, as well as an explanation of the benefits and drawbacks of change. After modifications have been implemented, new processes have been integrated into routines and rooted through proper mechanisms of rules and procedures to sustain the new balance, the final stage is to refreeze it.

The execution of change processes resulted in a variety of notions. There are many different change theories, each expressing a distinct idealism with its own set of expectations about the environment, people, and social institutions. The most frequently addressed ideas in the literature are realist ideas (structured or scientific management) as well as evolution (adaptive changes). The core concept of evolution is that change is a gradual process shaped by external factors. Humans have limited control over the kind and direction of change in this paradigm, which is deterministic. Changes are planned and implemented when they are needed, but crucial parts of changes are planning, evaluation, and planning for organizational development and improvement. Strategy and teamwork are included (Van de Ven & Poole, 1995). The plan change theory focuses on the first function, adaptive change, while the other two types of models incorporate opposing assumptions and depict chasms such as materialism vs. idealism, subjectivity vs. objective, society vs. technology, and so on. The theory also serves a secondary purpose. Both contingency and control have become regarded as the design of the change process, according to the author's research (Czarniawska-Joerges & Sevon, 1996). As a result, more concepts have been developed to address the faulty beliefs of the proposed adaptive change paradigm, including dialectic theory, lifecycle theory, social learning theory, paradoxical theory, and complexity theory. The above theory is subject to several critiques. For example, from the perspective of an objective observer, the idea of social cognition is rational, with an emphasis on learning and control, without taking into account the concepts of participants' reflexivity and reality, as well as their social interaction.

2.12 Change Approaches for Sustainability

Multiple forces are at work in social change, according to Lauer (1991), and no single element can fully explain it. Social transformation refers to significant changes in social structure, whereas structure refers to "patterns of social behaviour and interaction" that comprise values, standards, as well as different cultural phenomena (Giddens, 1984). Change is defined by scholars like Hargreaves (2011) and Bamberg (2003) as a modification of a social process, pattern, or structure. Also, change can imply altering established patterns of interpersonal connections and behaviour, which necessitates the collaboration of all parties concerned. People must be convinced that the suggested changes are both possible and desirable for them to take place in society. This necessitates a methodical idealism that is both feasible and desirable. This ideology depicts the ideal future, interprets the past, and offers significance to the present (Lauer, 1991). Change does not come easy, but it takes consistent efforts from all stakeholders especially the government in driving good policies. Figure 9 depicts the various features that the government may implement employing four ways that include enable, engage, exemplify and encourage, as well as numerous components that fall under each of these approaches.

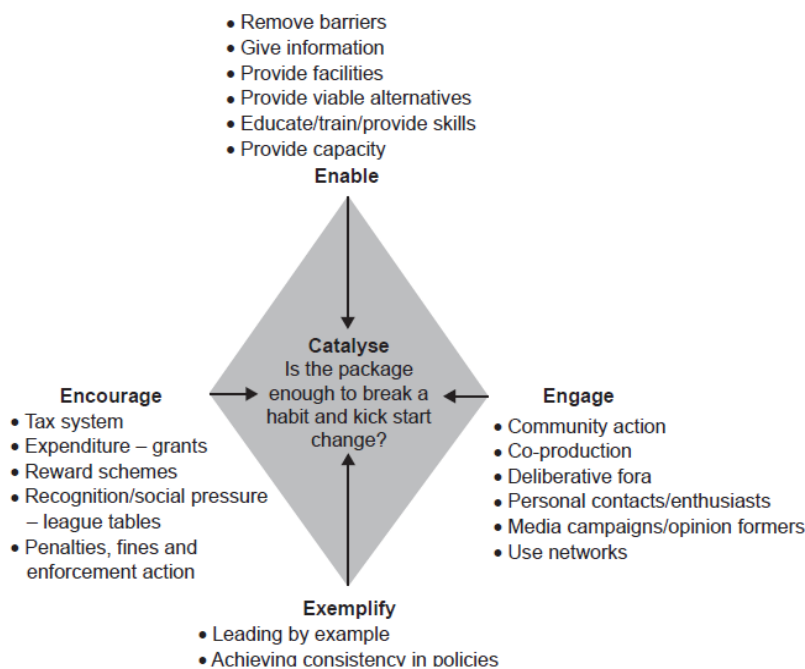


Figure 9: Model for Behavioural Change (Source: © Crown, 2005)

While all of these elements are regarded to be necessary for change, they may not be sufficient when behaviour is ingrained. Additional rules or methods may be required to influence people's minds in these situations.

These practices should be followed by executives and sustainability experts. Sustainability experts and executives have typically established sustainability-related change plans and controls, which have been passed down to construction sector management. The management teams' and executives' plans and visions are conveyed and implemented. These methods are increasingly being admonished for failing to engage communities and frontline workers, as well as for allowing operational realities to influence plan execution (Fraser *et al.*, 2006). All stakeholders are involved in the bottom-up approach to change, which allows them to drive the change including the advantages of in-depth understanding. Fraser *et al.* (2006) approaches to this shift include a collaboration of specialists, managers, local communities, and other stakeholders, as well as the local values that underpin specific administrative decisions, all of which implies this point. He claims he will give a database that represents his viewpoints. This also aids in the development of public support for policy changes.

One great way to empower and educate the community is by involving all stakeholders as well as engaging them. The shortcomings in the top-down method, Fraser *et al.* (2006) recognized, made it easier to codify bottom-up stakeholder participation in social and environmental management processes. A critical component of more successful sustainable building initiatives includes actively involving people and key community stakeholders in making a decision and in the drafting of relevant plans. Some academics say that developing a structure that brings together specialists and stakeholders to establish measures to monitor sustainability demands and progress is vital (Du Plessis & Cole, 2011).

2.13 The Nigerian Construction Industry's Obstacles to Sustainable Procurement

The Chartered Institute of Purchasing and Supply (2013) states that sustainable procurement includes a social and moral process, minimizing environmental effects arising from the supply chain, and implementing solutions that are sound economically, enshrining these in a decent business structure. Sustainable procurement saves unnecessary expense and decreases waste by asking whether a purchase is necessary, reducing quantities if necessary, encouraging recycling, conserving energy and water, restricting packaging, and enhancing transportation effectiveness. Mensah & Ameyaw (2012) defines traditional procurement as seeking value for money, with sustainable procurement concerned about value for money throughout the life cycle, taking into consideration social, economic, and environmental factors. Sustainable procurement, according to Kalubanga (2012), is the use of sustainable development concepts to procure, which is vital in establishing a world that is habitable with a high quality of life for people.

Achieving sustainable procurement is difficult because there are several ambiguities in the pre-contract stage (Varnäs et al., 2009). Only a few studies have concentrated on the issue with the majority of literature largely overlooking the issues of sustainable procurement. Abduh (2018), on the other hand, discovered the following difficulties:

- A yearning to remain the same
- Culture-influenced behaviour
- Disputes based on priority
- insufficient education and training
- A complete lack of innovative solutions
- Limited resources and long-term solutions
- Deficiency in quality
- Payment delay
- Insufficient funding and corruption

- Low awareness, insight, data, dedication, demand, and support
- Absence of motivation and long-term evaluation, connectedness and integration, and the appearance of sustainable adaptation
- Time limitations in the pre-contract stage
- Failure to enforce and implement relevant laws
- Inadequate project monitoring and control

On risks associated with tender and contracts, it is important to know how these can be measured at an early stage in a project. According to Yuni et al. (2017), risk is the possibility of financial loss, delay due to uncertainty, physical injury or damage. In construction, risks affect the cost, quality and time of a project. Risks must be identified early in the pre-contract phase and adequately measured. Critically analyzing tenders and contracts is one important step followed by preparing a risk log. The risks can then be mitigated, and treatment measures obtained. In assessing risks, a classification based on the degree of consequence may be utilized (Godfrey, 1996). Risk can then be classified as:

- Unacceptable Risk: This type of risk cannot be tolerated.
- Undesirable Risk: This type of risk needs to be treated immediately.
- Acceptable Risk: This type of risk is acceptable.
- Negligible Risk: This type of risk can be neglected and may or may not have an impact on a project.

Strategies include minimizing the possibility of adverse effects and avoiding risks. Risk management concentrates on a methodical approach to risk identification, analysis, and mitigation. The project's aims and objectives will be impacted by the risk's ambiguity. By gathering additional data and using a better model, the uncertainty brought on by human activities or technologies may be decreased. From the beginning to the end of the project cycle, risk management should be implemented (Husen, 2011).

3. Research Methodology

3.1 Introduction

The research technique utilized to evaluate several sustainable procurement strategies in the Nigerian construction industry is discussed in this chapter. The method of research, respondent population, sample sizing, data collection, and statistical methods utilized in the study's data analysis are all detailed in this chapter. The numerous methods of analysis, as well as the main outcomes, are discussed. A mixed-methods methodology based on the pragmatic paradigm was employed to attain the study's purpose, which included both qualitative and quantitative data progressively.

3.2 Research Design

An explanation on the methodology employed in this research is necessary before reviewing the findings from this research. The Oxford English Dictionary defines research as a "Systematic examination of and analysis of materials and resources to corroborate facts and create new conclusions". Academic and commercial interests both rely substantially on research. As a result, it signifies different things to different people. A scientifically conducted study or inquiry, including the gathering of data and analysis procedure, are all instances of research. It is both an addition to existing information and a learning process (Naoum, 2003).

To develop the theoretical framework for this study, secondary data was acquired from connected literature resources such as journals, books, conference proceedings, papers in publications, reports, e.tc. Building a sustainable procurement knowledge base in the construction industry, with a focus on Nigeria was the key purpose of this phase. Answering research questions thoroughly necessitates a sound research approach that also aids in the attainment of the goals. Based on a review of the literature and a thorough examination of the Nigerian construction industry, the author was unable to locate any construction company in Nigeria that is currently using sustainable procurement in an

official capacity. Although their organizations do not officially implement sustainable procurement, some experienced construction professionals in Nigeria who were interviewed underlined that they had read widely about it and used it in their day-to-day activities. However, for this thesis, both questionnaires and case studies were used as research methods. A mixed research method blends qualitative and quantitative methods, procedures for gathering data, as well as analysis to answer research questions (Creswell, 2018). The primary benefit of this increasingly popular strategy is the ability to integrate the strengths of the qualitative and quantitative methods, and this cannot be obtained with the use of one method only (Johnson & Onwuegbuzie, 2004).

3.3 Questionnaire

Over time, the use of an electronic questionnaire has been proven to be one effective method of reaching a significant number of respondents over a short period. The online questionnaire for this study was created and administered using Google Forms. This tool was quite helpful in examining and comprehending the data presented. The research participants were asked closed-ended and open-ended questions based on the information acquired from the literature review and the defined research topics. The questionnaire included factual and opinion-based questions aimed at gathering information on the individual's professional status, expertise, viewpoint, and observation on the subject, as well as recommendations for the future. All questions were mandatory to prevent the possibility of a low response rate where respondents may be able to withdraw from the survey halfway. The questionnaire was directly sent out to construction professionals who carried out procurement as part of their official duties and 41 completed questionnaires were received within three months. The analyzed data was also subjected to inferences and descriptive representation.

3.3.1 Validity and Reliability of the Questionnaire

Questionnaires are widely used in research, according to Wentzel-Larsen *et al.* (2011), and their value as tools is dependent on both validity and reliability. The content and time

necessary to complete the questionnaire, according to Litwin (1999), may cause changes in focus and enthusiasm throughout the questionnaire. In addition, validity refers to how well a survey evaluates what it claims to evaluate, and reliability means how consistent the measurement is.

3.3.2 Data Analysis Method and Presentation

Data was summarized and then statistically and qualitatively analyzed using descriptive statistics. Quantitative procedures included frequency and percentage frequency, while qualitative studies included content analysis. To calculate frequencies and percentages, the data was presented statistically in the quantitative analysis. Tables were used to present the information. The quantitative data was analyzed, conclusions were reached, and the results were displayed using descriptive graphs, tables, and percentages.

3.3.3 Population for the Survey

The survey's core respondents had expertise and experience with procurement. The group chosen has experience with sustainability and has performed or is currently undertaking procurement activities in their respective firms. For the investigation, a total of 51 people were contacted. The questionnaire allows us to determine the required qualifications and years of construction sector experience. The research questions also allowed respondents to express their opinions freely based on their construction experience. Finally, the respondents were asked to make recommendations on the kind of purchasing policies that construction companies in Nigeria could adopt.

3.4 Case Study

The approach used in the research for the case study provides substantial knowledge and a clear insight into the topic, as well as insight and ideas to validate the happenings (Fellows & Liu, 2003). This research method is proven to be effective in conducting in-depth investigations and helps in offering a strategy that can be valuable for upcoming

projects. Getting a construction company in Nigeria with official policies on sustainable procurement was difficult and the author could not find one within the time frame of the research. Most of the professionals who applied sustainability in the procurement process at one point or the other do not have an adequate record to show the outcome. However, one project completed with the application of sustainable procurement principles, by a Project Manager in Lagos State Nigeria who works for Millisheild Integrated Services will be studied. In addition, the author searched outside of Nigeria for countries where sustainable procurement is performed, and two projects were chosen as case studies from Procura+. Procura+ is an European Sustainable Procurement Network concerned with sustainable and innovative procurement. They provide support and advice to public authorities interested in the implementation of sustainable and innovative procurement. Procura+ has published several case studies where sustainable procurement has been implemented and their analysis on the selected projects meets the criteria required to be employed for this research given the scope of study, Nigeria.

A total of three projects were studied to reach a better result, each of which differed from the others in terms of application:

- **Case Study 1** – Kenttätäkatu Kindergarten, Hyvinkää Municipality, Finland (Procura+, 2018)
- **Case Study 2** – Motorway A6 Almere- Havendreef, Rijkswaterstaat, Netherlands (Procura+, 2017)
- **Case Study 3** – A Two-Floor Family House in Ikorodu, Lagos State, Nigeria (Millisheild Integrated Services, 2016).

3.5 The Triangulation Method

The triangulation method is used in the research, and the following aspects are taken into account in the research design:

- i. A variety of research methods were utilized to examine the benefits, challenges, and long-term procurement techniques that could be implemented in the construction business. A questionnaire survey was utilized to get professional

perspectives on the challenges faced as well as recommended policies and measures. A case study and a literature review were also used.

- ii. Results from the literature review were compared to outcomes from the questionnaire and case studies.

The case study's findings aided in pinpointing the basic reasons why sustainable procurement in Nigeria appears to be failing. The questionnaire survey offered information on a variety of risk-related factors, policies, and initiatives, as well as confirmation of the literature review and case study findings. The survey was useful in establishing the source of some faults revealed in the literature review and case study research as a result of general effects.

3.6 Conclusion

Mixed triangulation was employed in the research, with a case study serving as the primary source of data analysis and a questionnaire survey using a range of data collection approaches. All data collection procedures, as well as outcomes from a case study and survey methodology, will be discussed and mentioned in the next chapter.

4. Data Presentation, Analysis, And Discussion of The Results

4.1 Introduction

This chapter looks at the results of the major research stages. The survey gathered information on sustainable procurement from various construction professionals, as well as the extent to which they wished things could change in Nigeria. Studies on projects where the principles of sustainable procurement were applied, formed the basis of the primary research. Barriers to sustainable sourcing have been identified based on primary research data.

4.2 Case Study 1: Kenttäkatu Kindergarten, Hyvinkää Municipality, Finland

4.2.1 Project Description

The project is located in Hyvinkää, Finland a small Municipality of 46,500 people committed to a set of Environmental Aims that will guide its strategy from 2013 to 2020, including targets for environmentally friendly construction and maintenance, efficient energy consumption, public procurement and environmental-climate protection. Building the first eco-labelled preschool in Finland was a set ambition for the municipality. The plan was initiated in 2015 and the contract was completed in 2017. The building was to house about 200 children. Upon completion in 2017, the building won the Nordic Swan Ecolabel award.

4.2.2 Sustainable Procurement Approach

Step 1: A Request for Information (RFI) was published on National Electronic Tenders Portal to check if any contractor will be interested in establishing a committed partnership with the municipality.

Step 2: The municipality sourced additional information on energy-saving methods (e.g., energy consumption and air ventilation efficiency, solutions in lighting, heating, etc.)

Step 3: Additional information on new building methods, techniques and innovative building materials was also sourced.

Step 4: Response to the RFI was received from 4 contractors.

Step 5: A one-on-one meeting between the contractors and procurement personnel and a market dialogue was conducted.

4.2.3 Selection Criteria

The following were required from the 4 contractors:

- Recommendation of a staff member to be in charge of the ecolabel certification process management.
- A plan detailing how the construction process would be carried out by the contractor and their subcontractors to satisfy the requirements of Nordic Swan.
- A proposal specifying how the building would eventually meet the Nordic Swan energy consumption requirements.

The sustainability requirements to be met by the contractors included the following:

- Overall energy use should be at or below 75% of the national upper standard level, which is 127kWh/m² per year. This was the source of heating (including district heating, lighting, cooling, electrical equipment, control and automation, heat recovery and thermal insulation, windows and reducing the consumption of hot water).
- A proposal for establishing ecologically friendly energy consumption criteria for heating, ventilation, and air conditioning (HVAC) systems, and how well the controls for these systems can be modified.
- A proposal for calculating and collecting data on energy consumption.

4.2.4 Criteria for Award

The contract was granted based on the most economically advantageous tender (MEAT), which took into account the following criteria:

- 50% for the lowest price offered.
- 50% for Qualitative measures which included layout/functional characteristics, façade, suggestion on delivery routes/parking, a full-time employee with relevant work experience and certifications to oversee the ecolabel process and plans on keeping materials and construction dry at all times.

4.2.5 Results of the Bid

The results of the bid are outlined below:

- All contractors met the mandatory requirements and the specific standards.
- The anticipated building cost was estimated to be €7 million.
- All offers were lower than expected. The winning bid was €4,850,000 while the highest bid was €6,595,000.

4.2.6 The Impact of Using Sustainable Building Materials in the Project

The desired sustainability level was achieved and below are outlined the impacts of the use of sustainable materials in constructing the building:

- Only ecolabel-approved chemical-free materials and products were used and this ensured that emissions were minimal both indoor and outdoor.
- At the end of the building's life cycle, the materials used are either recyclable or safe to dispose off.
- The structure has also been designed to be dismantled and reconstructed elsewhere if necessary or to have modules safely uninstalled and recycled within the factory.

- The outdoor play equipment meets Swan Ecolabel standards, as it is constructed of untreated wood or certified FSC wood, and the climbing ropes are made of natural fibres.

All of the materials are more environmentally friendly than traditional building materials, reducing the structure's carbon footprint. Furthermore, while typically 10-15% of construction materials wind up as trash, this was kept to only 5% in this project. Other impacts the sustainable design had on the project include:

- A minimum of 2.5% daylight factor in the common rooms.
- Lower noise compared to a standard preschool building.
- Demand controlled ventilation with installed CO₂ monitors that automatically adjust readings from moisture
- Generation of Green electricity from the incineration of biodegradable household waste.

4.2.7 Lessons Learned and Relation to the Nigerian Construction Industry

The winning bid was €4,850,000 but the building cost about €6 million in the end. There were final modifications carried out during construction which increased the total building cost. This was an expected turn as it was the first in the municipality. However, it is worth noting that the construction was completed on time starting in autumn of 2016 and finishing in August 2017. During the construction phase, building operations were also closely monitored and managed to guarantee that no environmental or structural hazards arose later in the building's existence. The construction process also necessitated creative material procurement, which required the builder to cultivate close relationships with suppliers to determine the source of materials and locate replacements for components that did not match the ecolabel requirements (for instance, standard MDF panels were replaced with low formaldehyde panels). Figure 10 portrays the ecolabel-compliant kindergarten.



Figure 10: Kenttätatu Kindergarten, Hyvinkää Municipality, Finland (Source: Hyvinkää Municipality, 2017)

Traditional procurement is the most extensively employed mode of procurement in the Nigerian construction industry, as evidenced by the literature review. In this Kenttätatu Kindergarten project, the process was raised to an even better standard. With the market dialogue, for example, the quality of the bids had clearly increased, with each demonstrating an understanding of the municipality's goals as well as a well-crafted assessment of sustainability standards and requirements. Exploring the concept of change in chapter 2 above shows that a lot of professionals and construction companies in Nigeria fear to lose money in trying to adopt sustainable procurement in the construction process. It can be seen from this project that the pros outweigh the cons. Ambitious procurement staff's experience was also essential in establishing first ambitious goals and providing guidance. Setting defined goals and taking the time to learn about the market, as well as the potential requirements and ecolabels that fit within the goals, shows that it is feasible to procure safe, healthy, and environmentally friendly buildings that can also save money in the long run.

4.3 Case Study 2: Motorway A6 Almere- Havendreef, Rijkswaterstaat, Netherlands

4.3.1 Project Description

The Netherlands has set a goal of cutting CO₂ emissions until 2020 by 20%, compared to the levels it was in 1990 and has set a target of 14 per cent renewable energy output by 2020, up from 2% in 2010. To help achieve these goals, the Dutch House of Commons set a goal in 2010 for all public entities in the Netherlands to employ 100 per cent sustainable procurement by 2015 (by including green criteria in all tenders). Rijkswaterstaat is the Dutch Ministry of Infrastructure, and it is the Environment's Department of Public Works. It has a €3.5 billion yearly budget and is the country's largest infrastructure investment. It employs approximately 8,500 people and is responsible for managing the Netherlands' major waterways, coastal water systems, and highways. Rijkswaterstaat announced a Design, Build, Maintain, and Finance (DBMF) contract in 2015 to widen and maintain a 13-kilometre section of road between Almere Havendreef and Almere Buiten Oost during a 20-year period. This project is part of a larger effort to increase traffic flow and road capacity along the Schipol-Amsterdam-Almere (SAA) corridor.

4.3.2 Sustainable Procurement Approach

Step 1: A Design, Build, Maintain and Finance (DBMF) contract is announced.

Step 2: An 'Economically Most Advantageous Submission' (EMAS) system is used to choose tenders based on quality and price.

Step 3: Quality factors are assigned monetary values by Rijkswaterstaat. These figures are then reduced from the actual quoted price to get a 'corrected total price' that takes into account environmental factors.

Step 4: The bidder with the lowest 'adjusted total price' is awarded the contract.

4.3.3 Selection and Criteria for Award

Rijkswaterstaat created two methods to measure and monetize sustainability during the awards phase:

- **The CO_{2e} Performance Ladder:** This certification scheme allows bidders to demonstrate that they have done (or will take) steps to reduce CO₂ emissions within their firm, projects, and supply chain. It is used to modify the overall price by comparing the expected emissions from the proposal to a set of levels, or 'rungs,' with each subsequent performance rung deducting 1% from the final offer price. Up to 5% can be subtracted from the total price.
- **DuboCalc:** This Life Cycle Analysis (LCA) method calculates the Environmental Cost Indicator (ECI), or the sustainability of the materials required in a design enabling bidders to experiment with different design options and maximize the sustainability of their offer. The lower the ECI number, the lower the cost to the environment.

Rijkswaterstaat can assess and pick a supplier based on more comprehensive information on cost and quality by monetizing efforts to decrease environmental externalities.

4.3.4 Results of the Bid

The results of the bid are outlined below:

- The winning tender was €200,000,000 and had a quality that was on the fifth floor of the CO₂ performance ladder meeting the ideal ECI score.
- The proposed quality of the winning tender was to be achieved through smart construction transportation solutions ensuring that the need to transport materials by road would be greatly reduced, reduced the quantity of asphalt to be used, and reduced use of primary raw materials by using more of recycled materials.

4.3.5 The Impact of Using Sustainable Building Materials in the Project

The construction of the road as well as other infrastructure projects, such as tunnel and bridge construction, have a variety of environmental consequences. Through the CO_{2e} Performance Ladder, RWS has discovered a means to look at contractors' approaches to managing total emissions, as well as the wide variety of environmental implications linked with the materials used in the design through DuboCalc. CO_{2e} emissions are one of the 13 characteristics that contribute to the ECI Value, and they accounted for 44% of the overall ECI Value in this project (as calculated against a reference design). The winning design for resurfacing the A6 motorway had the highest ECI score of 6,000,000, resulting in a reduction of 52,800 tonnes of CO_{2e} emissions and 15,048 tonnes of oil (toe) equivalent throughout the project's lifetime (or annual savings of 1,056 CO_{2e} and 301 toe).

4.3.6 Lessons Learned and Relation to the Nigerian Construction Industry

A lot was needed to be assessed on this project to ascertain the level of most outcomes especially the reference design needed for comparison. It was observed that DubloCalc required expertise. However, the project was a success as the main aim was achieved. Carbon emissions were reduced significantly, and this outweighs the increased cost of tendering. Figure 11 shows the finished project.



Figure 11: The New Motorway A6 Almere- Havendreef, Netherlands. (Source: eAutobahn, 2022)

The high cost of tendering this project would be a turn-off for contractors if it were to be in Nigeria. Since one of the primary goals of contractors is to maximize profit while lowering client costs, this approach may not work in the Nigerian construction business. The mandatory inclusion of green criteria in all public tenders in the Netherlands has left contractors with no alternative but to align their services with the government's long-term ambitions. This is one method that the government in Nigeria can adopt to drive sustainability. Contractors in the Nigerian construction business would align their operations to sustainability if they don't have a choice, and sustainability can be promoted with one, two, or more successful projects.

4.4 Case Study 3: Two-Floor Family House in Ikorodu, Lagos State, Nigeria

4.4.1 Project Description

The client who initiated this project believes so much in sustainability and wanted to build a smart and sustainable house for his family. The project was initiated in June 2016 and completed exactly 10 months after in April 2017. The client had funds readily available to complete this project. The exchange rate used in this case study is based on the official rate from Central Bank of Nigeria (CBN) accessed on 01 July 2022.

4.4.2 Sustainable Procurement Approach

The client contacted some construction companies within Lagos State as he wanted the company that will build to be based in the same state. Even though he was interested in sustainability, his knowledge of the subject was limited. Part of the deliverables from the construction companies was a plan on how they intend to meet his sustainable goal. The approach used is outlined below:

Step 1: The client drafts all basic requirements including sustainable requirements.

Step 2: The client contacts 5 construction companies in Ondo State with his brief.

Step 3: Contactors submit a detailed plan on how to achieve all client's goals with additional recommendations.

Step 4: The client meets with contractors, agrees to go with design-and-build contract and asks contractors to submit their design and corresponding estimates.

Step 5: The client selects and awards the contract to the second-lowest bidder because the lowest bidder did not meet all requirements and could not clearly explain how to achieve the client's goals.

4.4.3 Selection Criteria

The criteria the client used are listed below:

- Less cement to be used and a sustainable alternative proposed.
- Highest daylight factor
- Solar panels to power the whole building
- Lighting Sensors
- More sustainable materials to be used
- Other Sustainable recommendations

4.4.4 Criteria for Award

The client awarded the contract to the contractor who gave the best price for all his requirements but most importantly better sustainable recommendations. The awarded contractor proposed the following amongst others:

- The use of stabilized interlocking bricks made from laterite clay to reduce the amount of cement to be used.
- The use of reclaimed wood for most wooden works
- Installation of high-quality solar panels
- Installation of energy-saving bulbs
- Installation of sensors for lighting and water
- The design will ensure a high daylight factor and good ventilation

4.4.5 Results of the Bid

The results of the bid are outlined below:

- All contractors met the minimum client requirements.
- The anticipated building cost was estimated to be ~~N~~49 million (€113,166.74).
- The client chose the second-lowest bid as the contractor satisfied all his requirements. The winning bid was ~~N~~54,730,000 (€126,400.32), the lowest bid was ~~N~~51 million, and the highest bid was ~~N~~63,020,000 (€145,546.28).

4.4.6 The Impact of Using Sustainable Building Materials in the Project

The impact of the sustainable materials used in the construction of this project cannot be underestimated. Below are some of the numerous benefits:

- The use of the stabilized interlocking laterite bricks cut down CO₂ emissions, reduced energy and minimized waste. The laterite clay which is the major material used in making these bricks is abundant in Nigeria and was easily produced on-site thereby reducing transportation costs.
- All the wooden works were done with reclaimed or recycled wood also reducing wastage
- The solar panels used along with all its accessories were eco-friendly and carefully sourced.
- The energy-saving bulbs require less energy to emit the same amount of light compared to traditional bulbs. It also lasts more than 10 times its counterpart.
- Having a green area not only purifies the air but also beautifies the surroundings.

4.4.7 Lessons Learned and Relation to the Nigerian Construction Industry

This project was constructed in Nigeria and interestingly, the total amount spent on the project was less than the amount the contractor projected during the bid. The project was

completed with about N52 million (€120,095.31). Solar panels were the most expensive materials used in construction. The stabilized interlocking bricks were cheaper than the conventional blocks as less cement was used, production was done on-site, labour was cheaper, and the raw material (laterite) was abundantly available. Figure 12 and 13 shows the interlocking bricks being laid and 85% completion of the project respectively.



Figure 12: Laying of the stabilized interlocking laterite bricks. (Source: Millisheid Integrated Services)



Figure 13: The Two-Floor House at 85% completion. (Source: Millisheid Integrated Services)

The fact that regulatory bodies that are supposed to monitor compliance with green building codes do not care is a major source of concern in the Nigerian construction industry. This project only shows that it is possible to build many sustainable buildings in Nigeria with not too high a cost. Nigeria is blessed with so much natural resources that even with the ever-increasing population and almost zero sustainability compliance, these resources are yet to deplete.

4.5 Data Analysis from Questionnaire

Responses to the 41 questionnaires received are analyzed in this section. The questionnaire was designed in such a way that the respondents could not skip a question. There was however a downside to this as some of the respondents who knew little or nothing about sustainability filled the survey with incoherent answers. The design of the questionnaire aimed at assessing how well construction professionals understood the concept of sustainability, challenges faced in sustainable procurement, risk in tender contracts as well as their recommendations on procurement policies that can be adopted by construction companies in Nigeria. A sample of the questionnaire can be found in Appendix A. Apart from the personal information of the respondents, the questionnaire was not designed with options to be selected from or on a scale basis. It was however designed to know their specific thoughts on the questions asked. The different questions asked and their corresponding answers are discussed in the sub-sections below.

4.5.1 Respondents Demographic Characteristics

The survey targeted construction professionals such as Architects, Project Managers, Quantity Surveyors, Structural/Civil Engineers, Builders, and so on. 41 completely filled questionnaires were returned out of the 51 people contacted, resulting in an 80% return rate and a 20% non-return rate. Only 16 out of 41 filled questionnaires (40%) were considered valid. The demographic characteristics of all 16 valid responses are shown in Table 3 and Figures 14 to 19.

Professional qualification

Table 3 below reveals the professional qualification of the respondents. Architect, HSE Manager and Project Manager representing 18.75% each, Builder, Site Engineer and Structural Engineer representing 6.25% each, and both Quantity Surveyor and Principal Partner heading the construction firm, representing 12.5% respectively.

CATEGORY	FREQUENCY	PERCENTAGE
Architect	3	18.75%
Builder	1	6.25%
HSE Manager	3	18.75%
Principal Partner (CEO)	2	12.5%
Project/Construction Manager	3	18.75%
Quantity Surveyor	2	12.5%
Site Engineer	1	6.25%
Structural Engineer	1	6.25%

Table 3: Professional Qualifications of the Respondents

Work Experience

The construction work experience of the different respondents is shown in figure 14 below. 19% of the respondents had 1 to 5 years of work experience, 31% had 6 to 10 years, another 31% had 11 to 15 years and 19% had 16 years of experience. This shows that most of the respondents have 6 years or more of working experience in the construction industry.

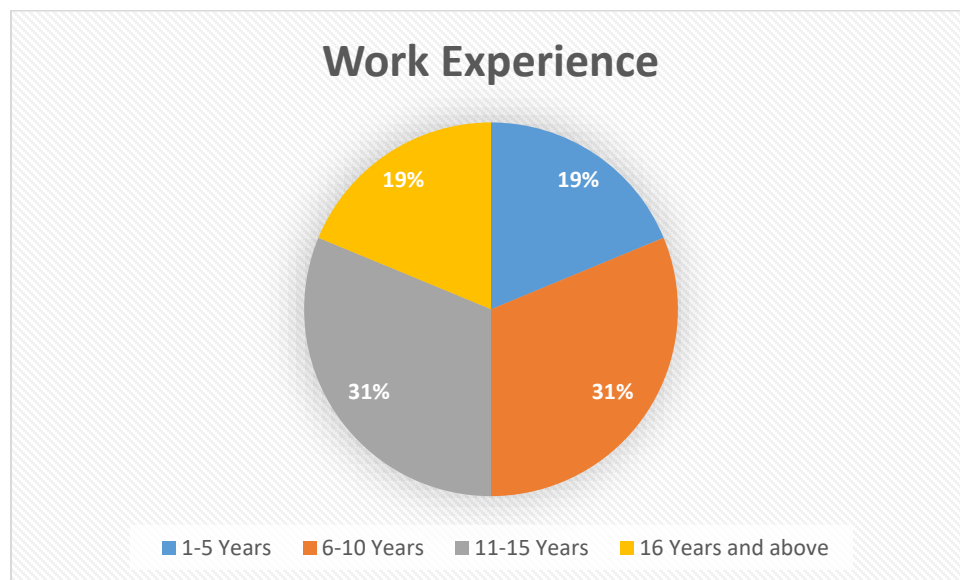


Figure 14: Work Experience of the Respondents

Age Groupings

Figure 15 shows the age group of the respondents where 6% of the respondents were between ages 18 and 25, 19% were between the ages of 26 and 33, 37% were between the ages of 34 and 41, and another 38% were above the age of 42. The majority of those who responded were above the age of 34.

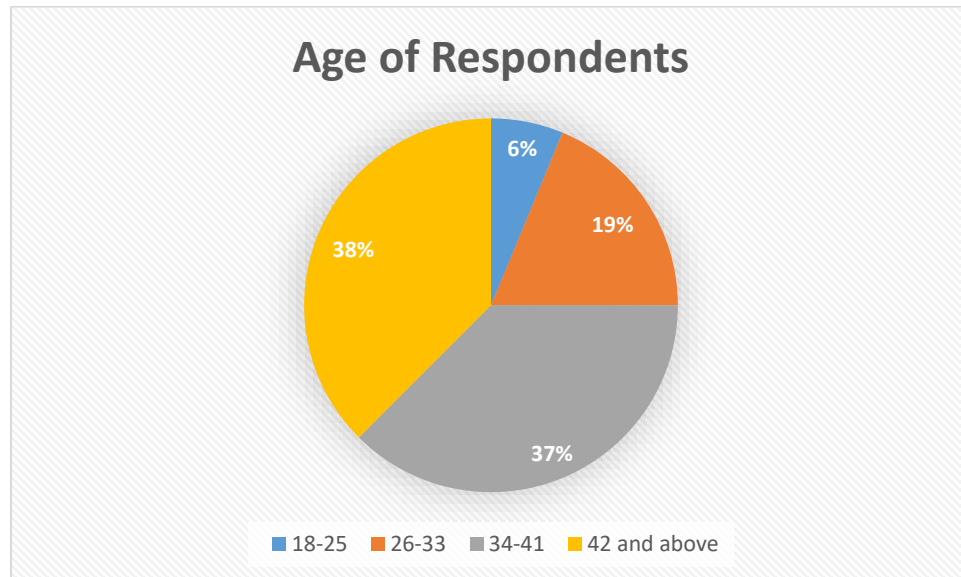


Figure 15: Age of the Respondents

Level of Education

Figure 16 below shows the responses received on the highest level of education. According to the data, 6% of those who responded had a Higher National Diploma, 50% had a Bachelor's degree and 44% had a master's degree. A bachelor's or master's degree was held by 99% of the respondents.

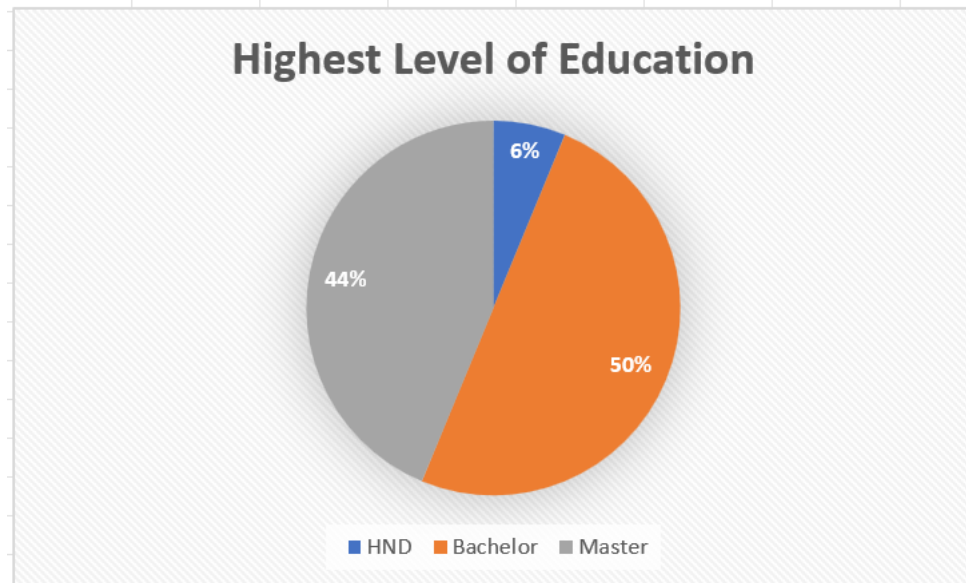


Figure 16: Highest Level of Education of the Respondents

4.5.2 How well the concept of sustainable procurement is understood

On a scale of 1 to 5, about 71.8% of respondents averagely understand the concept of sustainable procurement, 20.5% claim to understand the concept very well and 7.7% do not understand the concept (see figure 17).

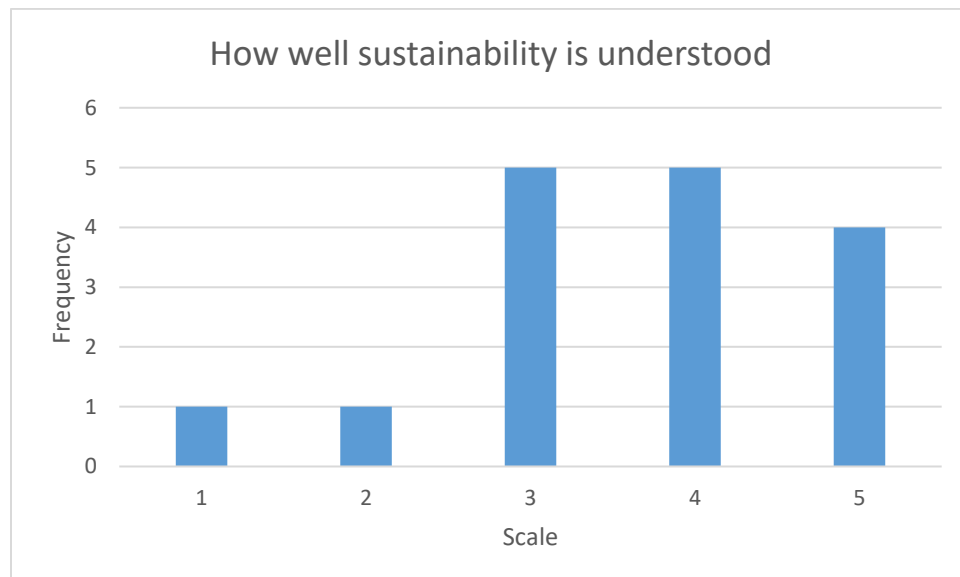


Figure 17: How well Sustainability is understood by the Respondents

4.5.3 Sustainability Strategies and Concerns of the various Organizations

According to Figure 18 below, about 97.4% believe that their organizations are concerned about sustainability issues.

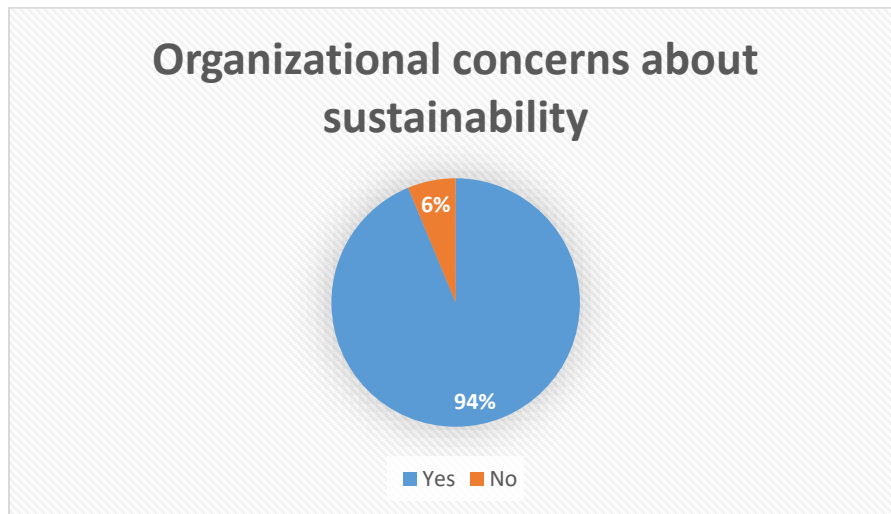


Figure 18: Organization concerns about Sustainability

Do their organizations have a defined sustainable strategy?

89.7% of the respondents believe that their organizations have a defined sustainable strategy while about 10.3% do not think so (see figure 19).

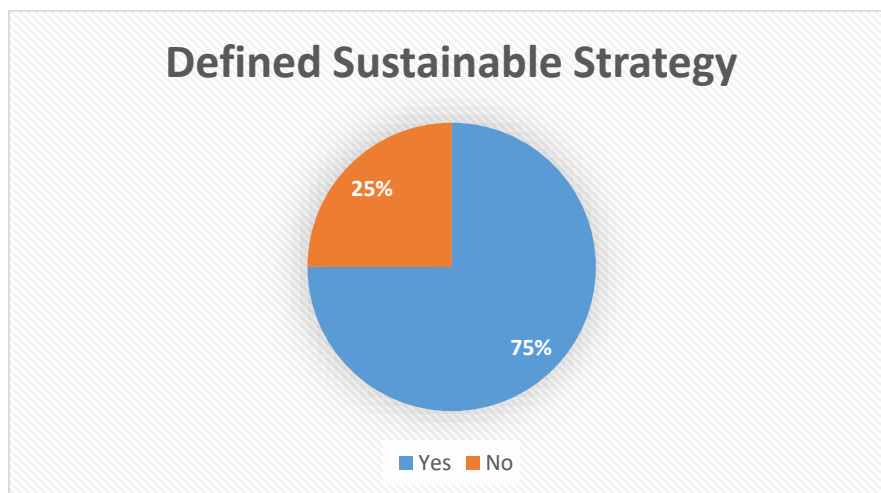


Figure 19: Defined Sustainable Strategy by the various Organizations

Companies' Sustainable Policy, and Why It Is In Place

The respondents were asked what the sustainable policy of their company is and why it is currently in place. Some of them stated that their companies do not have any sustainable policy. For others who claim that their companies have sustainable policies, the below points were extracted from their responses:

- Recycle all waste material.
- Avoid using paper wherever possible. For example, sending invoices and quotes via email as PDF files.
- Keep energy usage low.
- Purchase products with a lower environmental impact.
- Avoid unnecessary travel by making use of virtual platforms.
- To ensure that 3R'S of sustainability (Reduce, Reuse, Recycle) are attained efficiently while reducing waste from construction activities at 5% lower than the previous year. It's in place to show the management's commitment to sustainability.

4.5.4 Implementation Challenges of a Company-Wide Sustainability Strategy

As pointed out that sustainability is one concept that construction companies in Nigeria were yet to adopt, it was important to find out what implementation challenges these companies face. One way to find out was to directly ask construction professionals about this. Two main challenges stood out from the responses received, which were the **lack of awareness** and **perceived high cost**. They believe that construction professionals must be willing to unlearn and relearn. Other challenges the respondents gave her detailed below:

- Poor knowledge of sustainable sourcing strategies.
- High business risk – It is believed that there will be a lot of heavy spending on projects and immediate results would not be seen which may dampen the interest of all stakeholders to move further.

- Global instability and economic crisis – This negatively affects the importation of some vital sustainable materials that need to be imported into the country.
- Little support or pushback from suppliers – Most suppliers are concerned about making profit and would stock products that are in high demand. Since sustainable materials are not in high demand, suppliers tend to go with materials that yield high profits.
- Unfriendly government policies – Some respondents believe that the sustainable or green policies the government have put in place do not favour construction activities in Nigeria.
- Not having the right company structure in place – According to some respondents, there are companies without a good structure where anything flies. In such companies, implementing sustainability will be a dead idea before its arrival.
- Lack of honesty, transparency, and the will to implement – It is widely believed that all activities in a company should be transparent to all. Lack of honesty and transparency has left some stakeholders with no will to adopt the concept of sustainability.

Challenges faced by construction companies in introducing sustainable procurement

Some respondents stated that most clients are not ready to embrace the concept of sustainability which leaves the construction companies to do their bidding to remain in business. Also, within the organization, some respondents believe that there is **no corporate support** from their management. Other challenges faced by construction companies in introducing sustainable procurement are highlighted below:

- Inadequate finance/funding.
- Lack of knowledgeable staff.
- Project delivery time frame – This affects full compliance with sustainable procurement as some projects are fast-tracked while bureaucratic bottlenecks are bound in affecting the time required to deliver sustainable construction materials.
- High cost of some sustainable building materials.

- Corruption
- Mitigating risk
- Market stereotype

4.5.5 Factors Influencing the decision of a procurement officer during purchase

Responses that stood out as the factors influencing the decision of a procurement officer during purchase include the cost of the material, time-frame for the construction of the project, the quality of the materials, availability of the materials and delivery period. This was supported by some respondents who added market dynamics, accountability, budget, and storage capacities.

According to the respondents, below are some steps that could be taken by a procurement officer to aid in making the right decision during procurement:

- Proper planning and getting appropriate/accessible funds from management.
- Use of advanced technology to track market dynamics.
- Procuring from the right source and with the right quality.
- Procuring according to the right contract terms.
- Identify and qualify suppliers before negotiation.
- Enlighten clients and management.
- Place orders in time, especially for materials that are difficult to source and order to place with multiple vendors.
- Ensuring a transparent tender process.

4.5.6 Risk Measurement in Tender/Contracts

Procurement officers work a lot with tender/contract, and it is important that the contract terms are right. Even well-prepared contracts have risks, and it is important for procurement officers to note or measure these risks to know how to handle them properly.

Some of these risks may include lack of coordination in the supply chain, higher than expected running costs or a lower than expected income for a project. When risk is not handled properly, it most times leads to a disaster. One of the respondents believes that the greatest risk in a tender process is a lack of clarity which can lead to uncertainty and misunderstanding. The onus for principals is to therefore make sure that the tender process is fully and clearly documented and for tenderers to make sure that their tenders meet all the requirements. Responses received from other respondents about how risk can be measured in tender contracts are highlighted below:

- A project risk register has to be prepared and assessed by the client's risk manager evaluating the capability of the bidder to mitigate all relevant risks.
- Using qualitative risk analysis, quantitative risk analysis, collecting data from the company on internal policies and conducting Monte Carlo simulations of the company's past projects.
- By evaluating the scope of services, reviewing of performance schedule, reviewing of pricing system, and accessing the clients.
- Identifying potential risks early in the tendering process from both a contractual and operational perspective so that all parties are aware of their responsibilities, expectations, and working requirements.
- Properly check and vet the bill of quantities.
- Calculating costs based on inflation rates.

4.5.7 Recommended Sustainable Procurement Policies

When asked what purchasing or procurement policies that can be adopted by construction companies in Nigeria, a few respondents gave some interesting recommendations. It was also noted that not many quality recommendations were received and the author attributes this to the limited knowledge of the concept of sustainability that most respondents have. The recommendations received are highlighted below:

- Construction companies should switch to eProcurement because of the numerous benefits like transparency and ease.
- A requirement to carry out significant levels of pre-procurement market engagement with diverse suppliers to understand the market, test and generate ideas for innovation as part of the development of outcome-based specifications.
- Adopt the Triple Bottom Line of sustainability (TBL) initiative.

4.5.8 Conclusion on Findings from Survey

The responses received from the 41 respondents show that quite a lot of construction professionals believe that they understand the concept of sustainability but when asked in detail specific questions about sustainability and sustainable procurement, they were unable to give good and precise answers. However, the 16 respondents who were close to understanding this concept have aided the author's research. These answers has shown that construction companies and professionals in Nigeria have a lot to do regarding the adoption of sustainability and/or sustainable procurement.

5. Summary, Conclusion and Recommendations

The summary of this research, conclusion and suggestions based on the case studies and inferences from the respondent's survey are detailed in this chapter. The facts were analyzed, and conclusions were formed scientifically. The study's major contributions to knowledge were also identified.

5.1 Summary and Outcome

This study aims to evaluate the current strategies for sustainable procurement in the Nigerian construction industry, assess the obstacles that Nigerian construction professionals who take up procurement roles face and recommend procurement policies that can be adopted by construction companies in Nigeria. To fulfil these aims, a well-structured literature review was done supported by findings from case studies and a survey. Below are summarized the conclusions that have been drawn from the research conceptions to answer each objective, giving a clearer knowledge of what the research represents:

What are the perennial obstacles construction companies encounter in achieving sustainable procurement?

The second chapter of this research and some responses from the survey highlighted some obstacles that construction companies encounter in achieving sustainable procurement. The chapter explained that there are few studies on this issue in relation to Nigeria. Some of the highlighted obstacles include the yearning of construction companies to continue with old practices with no plans to introduce sustainable measures, lack of education and training on the subject, lack of funding, time limitation in the pre-contract stage, and inadequate project monitoring and control. One obstacle that cannot be ignored is the failure of the government to implement and enforce relevant laws. Lessons learned from the case studies in chapter four highlighted that the high cost of tendering some sustainable projects and the almost non-existent market dialogue at the tender phase pose as obstacles to sustainable procurement and sustainability as a

whole. Case Study 3 shows that it is possible to build a sustainable project in Nigeria and not spend way over the client's budget.

What factors influence the decision of Nigerian Procurement officers during purchase?

Procurement officers consider a number of factors during the purchase of construction materials. The survey in chapter 4 stated the cost of the material, time-frame for the construction of the project, the quality of the materials, availability of the materials and delivery period. This was supported by the case studies with some factors like proper planning and assessing available funds.

How can risks be measured for a tender/contract?

Tender contracts are very important in the process of procurement which when done improperly may mar projects. This is why construction professionals in Nigeria who handle procurement must handle tenders with care. One way to do that is to measure the risks that may be encountered. According to the survey in chapter 4, these risks can be measured by preparing a risk register and evaluating the capability of the bidder to mitigate all relevant risks. Also, the calculation of costs can be done based on inflation rates.

What purchasing policies can be adopted by construction companies in Nigeria?

In the outcome of the survey, eProcurement and Triple Bottom Line of sustainability (TBL) initiatives are outlined as policies a construction company can adopt to achieve sustainable procurement and sustainability as a whole. Adopting the right policies, position a construction company well for the achievement of sustainability not only in procurement but in all processes of the company. The Nigerian government can study the successful implementation of sustainable procurement and construction as a whole in other countries to come up with the right policies that will drive this concept effortlessly in Nigeria.

5.2 Conclusion

The study revealed that not too many construction companies, professionals and other stakeholders understood what the concept of sustainability and sustainable procurement is all about. A few more who understood are not ready to take a 'risk' by adopting this concept. The literature review and survey pointed out the gaps and challenges currently faced in the Nigerian construction industry. The case studies showed that it is attainable and possible to adopt sustainable procurement in Nigeria. All three research methods highlighted strategic sustainable procurement policies that could be adopted in the Nigerian construction industry. It is to the advantage of the construction companies, construction professionals, clients and investors to include sustainability in all construction processes, especially in procurement.

5.3 Recommendations

To determine the assessment of sustainable procurement strategies in the Nigerian construction industry, the recommendations below are given based on the findings of this research:

- All stakeholders involved in the construction process should have adequate knowledge and skills of this procurement process in advance to manage the factors or barriers that will limit the adoption of the partnership as a method of procurement during the construction of Nigeria.
- In strategizing sustainable procurement, critical considerations need to be noted on corruption and enhanced dynamic organizational structure and a clear chain of communication as the vitality of communication and the adverse effect of corruption in the industry cannot be over-emphasized.
- Government bodies responsible for enforcing sustainable policies should review the current public procurement act, add sustainable policies relevant to this time and enforce these policies.

- Companies should adopt eProcurement to ensure that fewer materials are consumed during the procurement process and that the quality of procurement strategies is increased. The process of procurement can improve with this and tick all sustainable requirements.

Declaration of Authorship

I hereby declare that the attached Master's thesis was completed independently and without the prohibited assistance of third parties, and that no sources or assistance were used other than those listed. All passages whose content or wording originates from another publication have been marked as such. Neither this thesis nor any variant of it has previously been submitted to an examining authority or published.

Berlin, 05.07.2022

Location, Date

Signature of the student

Appendix

Appendix A

Web-Based Questionnaire

Evaluation of Sustainable Procurement Strategies in the Nigerian Construction Industry

This survey was created to collect information and opinions for a study that would evaluate Sustainable Procurement Strategies in the Nigerian Construction Industry. There have been several studies on sustainable procurement concerning different parts of construction, but this is an uncommon topic in developing countries, especially in Nigeria. Traditionally, the construction industry is fixated on reducing the investment costs of building projects without jeopardizing quality, but fewer actions are taken towards maximizing the building's value over its service life. Thank you for your support as you complete this survey in less than 5 minutes.

* Required

1. Name (Initials & Surname) *

2. Age *

Mark only one oval.

- 18-25
 26-33
 34-41
 42 and above

3. Educational qualification *

Mark only one oval.

- ND
- HND
- Bachelor
- Master
- Doctorate
- Other: _____

4. Position within Organization *

5. How many years of experience do you have in the Construction Industry *

Mark only one oval.

- 1-5 Years
- 6-10 Years
- 11-15 Years
- 16 Years and above

6. How well do you grasp the concept of sustainable procurement? *

Mark only one oval.

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Is your organization concerned about sustainability issues? *

Mark only one oval.

Yes

No

8. Does your organization have a defined sustainable strategy? *

Mark only one oval.

Yes

No

9. What, in your opinion, is the most difficult aspect of developing and implementing a company-wide sustainability strategy? *

10. What are the challenges faced by construction companies in introducing sustainable procurement in business? *

11. What factors influence the decision of a procurement officer during purchase? *

12. How do you think this can be addressed (if negative), in your opinion? *

13. How can risk be measured in a tender contract in construction industry? *

14. What is your company's sustainable policy, and why is it in place? *

15. 12. What purchasing policies can be adopted by construction companies in Nigeria? *

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Google Forms

References

- Abduh, M., Wirahadikusumah, R. D., & Messah, Y. (2018). *Framework Development Methodology for Sustainable Procurement of Construction Works in Indonesia*, Vol. 203, 2, 14.
- Adebayo, A. A. (2002). Sustainable Construction In Africa. *Agenda 21 for Sustainable Construction in Developing Countries*.
- Adenuga, O., & Dosumu, O. (2012). Assessment of procurement methods used for executing maintenance works in Lagos state. *Ethiopian Journal of Environmental Studies and Management*, 5(4). <https://doi.org/10.4314/ejesm.v5i4.s6>
- Ahiakwo, O. A. (2014). *Improving Construction Processes In Nigeria Using The Last Planner® System* (pp. 11–12) [Doctor of Philosophy].
- Ahmed Ali, K., Ahmad, M. I., & Yusup, Y. (2020). Issues, Impacts, and Mitigations of Carbon Dioxide Emissions in the Building Sector. *Sustainability*, 12(18), 7427. <https://doi.org/10.3390/su12187427>
- Akadiri, P. O., Olomolaiye, P. O., & Chinyio, E. A. (2013). Multi-criteria evaluation model for the selection of sustainable materials for building projects. *Automation in Construction*, 30, 113–125. <https://doi.org/10.1016/j.autcon.2012.10.004>
- Alhazmi, T., & McCaffer, R. (2000). Project Procurement System Selection Model. *Journal of Construction Engineering and Management*, 126(3), 176–184. [https://doi.org/10.1061/\(asce\)0733-9364\(2000\)126:3\(176\)](https://doi.org/10.1061/(asce)0733-9364(2000)126:3(176))
- Ali Khan, M. W., Ting, N. H., Kuang, L. C., Darun, M. R., Mehfooz, U., & Khamidi, M. F. (2018). Green Procurement in Construction Industry: A Theoretical Perspective of Enablers and Barriers. *MATEC Web of Conferences*, 203, 02012.

<https://doi.org/10.1051/mateconf/201820302012>

- Awodele, O. A. (2014). *An Assessment of Success Factors and Benefits of Project Partnering in Nigerian Construction Industry*. www.academia.com
- Babatunde, S. O., Opawole, A., & Ujaddughe, I. C. (2012). An Appraisal of Project Procurement Methods in the Nigerian Construction Industry. *Civil Engineering Dimension*, 14(2). <https://doi.org/10.9744/ced.12.1.1-7>
- Babatunde, Y., & Low, S. P. (2015). *Construction Industry in Nigeria*. In *Cross-Cultural Management and Quality Performance*. pp. 45-57. Springer Singapore.
- Bamberg, S. (2003). How does environmental concern influence specific environmentally related behaviors? A new answer to an old question. *Journal of Environmental Psychology*, 23(1), 21–32. [https://doi.org/10.1016/s0272-4944\(02\)00078-6](https://doi.org/10.1016/s0272-4944(02)00078-6)
- Baumgartner, R. J., & Ebner, D. (2010). Corporate sustainability strategies: sustainability profiles and maturity levels. *Sustainable Development*, 18(2), 76–89. <https://doi.org/10.1002/sd.447>
- Berardi, U. (2013). Clarifying the new interpretations of the concept of sustainable building. *Sustainable Cities and Society*, 8, 72–78. <https://doi.org/10.1016/j.scs.2013.01.008>
- Berry, C. (2011). *The Sustainable Procurement Guide: Procuring Sustainably Using BS 8903* (ISBN 978-0-580-69861-3). British Standards Institution UK.
- Berry, C., & McCarthy, S. (2011). *Guide to sustainable procurement in construction*. CIRIA.
- Brammer, S., & Walker, H. (2011). Sustainable procurement in the public sector: an

- international comparative study. *International Journal of Operations & Production Management*, 31(4), 452–476. <https://doi.org/10.1108/01443571111119551>
- Brand, R., & Karvonen, A. (2007). The ecosystem of expertise: complementary knowledges for sustainable development. *Sustainability: Science, Practice and Policy*, 3(1), 21–31. <https://doi.org/10.1080/15487733.2007.11907989>
- Carew, A. L., & Mitchell, C. A. (2008). Teaching sustainability as a contested concept: capitalizing on variation in engineering educators' conceptions of environmental, social and economic sustainability. *Journal of Cleaner Production*, 16(1), 105–115. <https://doi.org/10.1016/j.jclepro.2006.11.004>
- Central Bank of Nigeria | Exchange Rate. (01 July 2022). [Www.cbn.gov.ng](http://www.cbn.gov.ng).
<https://www.cbn.gov.ng/rates/ExchRateByCurrency.asp>
- CIB. (2004). *50 Years of International Cooperation to Build a Better World*. International Council for Research and Innovation in Building and Construction (CIB), Rotterdam
- CIB. (2010). *International Council for Research and Innovation in Building and Construction*.
- Ciegis, R., Dilius, A., & Mikalauskiene, A. (2015). Evaluation of Economic Growth in terms of sustainability. *Transformations in Business and Economics*, 14(1), 105–125.
- Ciegis, R., Ramanauskiene, J., & Martinkus, B. (2009). The Concept of Sustainable Development and its Use for Sustainability Scenarios. *Engineering Economics*, 2(62).
- CIPS. (2013). *Ethical and Sustainable Procurement*. The Chartered Institute of

Purchasing and Supply

- Cole, R. J. (2012). Transitioning from green to regenerative design. *Building Research & Information*, 40(1), 39–53. <https://doi.org/10.1080/09613218.2011.610608>
- Creswell, J. W. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- Crosby, P. B. (1980). *Quality is free : the art making quality certain*. The New American Library.
- Crown. (2005). *Securing the future: delivering UK sustainable development strategy*. Presented to Parliament by the Secretary of State for Environment, Food and Rural Affairs by Command of Her Majesty
- Czarniawska-Joerges, B., & Sevon, G. (1996). *Translating organizational change*. W. De Gruyter.
- Dahiru, D., Dania, A. A., & Adejoh, A. (2014). An Investigation into the Prospects of Green Building Practice in Nigeria. *Journal of Sustainable Development*, 7(6). <https://doi.org/10.5539/jsd.v7n6p158>
- Dale, B. G., & Cooper, C. L. (1994). Introducing TQM. *Management Decision*, 32(1), 20–26. <https://doi.org/10.1108/00251749410050660>
- David, R., Griffith, A., & Hutchins, W. (2009). *Improving the effectiveness of partnering: Final report*. State planning and research project for Oregon Department of Transportation Research Group and Federal Highway Administration.
- Davis, P., Love, & Baccharini, D. (2008). *Building Procurement Methods Cooperative Research Centre for Construction Innovation*.
- Dempsey, N., Bramley, G., Power, S., & Brown, C. (2011). The social dimension of

- sustainable development: Defining urban social sustainability. *Sustainable Development*, 19(5), 289–300. <https://doi.org/10.1002/sd.417>
- Du Plessis, C. (2007). A strategic framework for sustainable construction in developing countries. *Construction Management and Economics*, 25(1), 67–76. <https://doi.org/10.1080/01446190600601313>
- Du Plessis, C., & Cole, R. J. (2011). Motivating change: shifting the paradigm. *Building Research & Information*, 39(5), 436–449. <https://doi.org/10.1080/09613218.2011.582697>
- Dyllick, T., & Hockerts, K. (2002). Beyond the business case for corporate sustainability. *Business Strategy and the Environment*, 11(2), 130–141. <https://doi.org/10.1002/bse.323>
- eAutobahn. (2022). *A6 Floriade 2022*. Eautobahn.de. http://eautobahn.de/html/a6_floriade_2022.html
- Ekung, S., Siriwardena, M., & Adeniran, L. (2013). Optimised Selection and use of Project Procurement Strategy in Nigeria: A Case from Practise. *Ethiopian Journal of Environmental Studies and Management*, 6(6). <https://doi.org/10.4314/ejesm.v6i6.9>
- Elkington, J. (1997). Cannibals with forks: the triple bottom line of 21st century business. *Choice Reviews Online*, 36(07), 36–399736–3997. <https://doi.org/10.5860/choice.36-3997>
- Ershadi, M., Jefferies, M., Davis, P., & Mojtahedi, M. (2021a). Achieving Sustainable Procurement in Construction Projects: The Pivotal Role of a Project Management Office. *Construction Economics and Building*, 21(1).

<https://doi.org/10.5130/ajceb.v21i1.7170>

Ershadi, M., Jefferies, M., Davis, P., & Mojtahedi, M. (2021b). Achieving Sustainable Procurement in Construction Projects: The Pivotal Role of a Project Management Office. *Construction Economics and Building*, 21(1).

<https://doi.org/10.5130/ajceb.v21i1.7170>

Fellows, R., & Liu, A. (2003). *Research methods for construction* (2nd ed.). Blackwell Science.

Fraser, E. D. G., Dougill, A. J., Mabee, W. E., Reed, M., & McAlpine, P. (2006). Bottom up and top down: Analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. *Journal of Environmental Management*, 78(2), 114–127. <https://doi.org/10.1016/j.jenvman.2005.04.009>

Giddens, A. (1984). *The Constitution of Society. Outline of the Theory of Structuration*.

Godfrey, P. (1996). Control of Risk: A Guide to the Systematic Management of Risk from Construction. *Construction Industry Research and Information Association London*.

Green, K., Morton, B., & New, S. (1996). PURCHASING AND ENVIRONMENTAL MANAGEMENT: INTERACTIONS, POLICIES AND OPPORTUNITIES. *Business Strategy and the Environment*, 5(3), 188–197. [https://doi.org/10.1002/\(sici\)1099-0836\(199609\)5:3<188::aid-bse60>3.0.co;2-p](https://doi.org/10.1002/(sici)1099-0836(199609)5:3<188::aid-bse60>3.0.co;2-p)

Hargreaves, T. (2011). Practicing Behaviour Change: Applying Social Practice Theory to Pro-environmental Behaviour Change. *Journal of Consumer Culture*, 11(1), 79–99. <https://doi.org/10.1177/1469540510390500>

- Henriques, A. (2007). *The triple bottom line : does it all add up? : assessing the sustainability of business and CSR*. Earthscan.
- Hill, R. C., & Bowen, P. A. (1997). Sustainable construction: principles and a framework for attainment. *Construction Management and Economics*, 15(3), 223–239.
<https://doi.org/10.1080/014461997372971>
- Hillman Willis, T., & Willis, W. D. (1996). A quality performance management system for industrial construction engineering projects. *International Journal of Quality & Reliability Management*, 13(9), 38–48.
<https://doi.org/10.1108/02656719610150605>
- Hopwood, B., Mellor, M., & O'Brien, G. (2005). Sustainable development: mapping different approaches. *Sustainable Development*, 13(1), 38–52.
<https://doi.org/10.1002/sd.244>
- Huovila, A., Airaksinen, M., Pinto-Seppä, I., Piira, K., & Penttinen, T. (2016, September). Smart City Performance Measurement System. *Sustainability and Innovation for the Future*. 41st IAHS WORLD CONGRESS, Albufeira, Algarve, Portugal.
- Husen, A. (2011). *Project management, Planning, Scheduling, & Project Control*. Yogyakarta: Andi Yogyakarta.
- Hyvinkaa Municipality. (2017). *PUBLIC ART*. H Y V I N K Ä Ä N T a I D E M U S E O.
<https://www.hyvinkaa.fi/hyvinkaan-taidemuseo/in-english1/collection/public-art/>
- Idoro, G. I. (2008). HEALTH AND SAFETY MANAGEMENT EFFORTS AS CORRELATES OF PERFORMANCE IN THE NIGERIAN CONSTRUCTION INDUSTRY/SVEIKATOS IR SAUGOS DARBE VALDYMO PASTANGOS

- NIGERIJOS STATYBŲ PRAMONĖJE. *JOURNAL of CIVIL ENGINEERING and MANAGEMENT*, 14(4), 277–285. <https://doi.org/10.3846/1392-3730.2008.14.27>
- Idrus, A., & Sodangi, M. (2010). *Framework for Evaluating Quality Performance of Contractors in Nigeria*.
- Irurah, D. K. (2001). *Agenda for Sustainable Construction in Africa*. An Invited Contribution to CIB's Agenda for Sustainable Construction in the Developing World and Agenda 21 on Sustainable Construction
- Jimoh, R. A. (2012). Improving Site Management Practices in the Nigerian Construction Industry: The Builders' Perspective. *Ethiopian Journal of Environmental Studies and Management*, 5(4). <https://doi.org/10.4314/ejesm.v5i4.5>
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed Methods Research: a Research Paradigm Whose Time Has Come. *Educational Researcher*, 33(7), 14–26. <https://doi.org/10.3102/0013189x033007014>
- Kalubanga, M. (2012). *SUSTAINABLE PROCUREMENT: Concept, and Practical Implications for the Procurement Process*.
- Kemp, R., & Martens, P. (2007). Sustainable development: how to manage something that is subjective and never can be achieved? *Sustainability: Science, Practice and Policy*, 3(2), 5–14. <https://doi.org/10.1080/15487733.2007.11907997>
- Kenny, C. (2007). Construction, Corruption, and Developing Countries. *Policy Research Working Paper Series*, 4271. The World Bank. <https://doi.org/10.1596/1813-9450-4271>
- Kibert, C. J. (2013). *Sustainable construction : green building design and delivery*. John Wiley & Sons.

- Kritsonis, A. (2005). Comparison of Change Theories. *INTERNATIONAL JOURNAL of SCHOLARLY ACADEMIC INTELLECTUAL DIVERSITY*, 8(1).
- Kubba, S. (2010). *Green Construction Project Management and Cost Oversight*. Elsevier. <https://doi.org/10.1016/c2009-0-20060-2>
- Lædre, O., & Haugen, T. I. (2006). *Use of Project Partnering in Construction; Examining the Effect of Project Integration and Target Pricing in Three Pilot Projects*.
- Larsen, E. R., & Lomi, A. (1999). Resetting the Clock: A Feedback Approach to the Dynamics of Organisational Inertia, Survival and Change. *The Journal of the Operational Research Society*, 50(4), 406. <https://doi.org/10.2307/3010461>
- Lauer, R. H. (1991). *Perspectives on social change*. Allyn And Bacon.
- Litwin, M. S. (1999). *How to measure survey reliability and validity*. Sage.
- Luu, D. T., Thomas Ng, S., & Chen, S. E. (2003). A case-based procurement advisory system for construction. *Advances in Engineering Software*, 34(7), 429–438. [https://doi.org/10.1016/s0965-9978\(03\)00043-7](https://doi.org/10.1016/s0965-9978(03)00043-7)
- Mbamali, I., & Okotie, A. J. (2012). An Assessment of the Threats and Opportunities of Globalization on Building Practice in Nigeria. *American International Journal of Contemporary Research*, 2(4), 143–150. <http://www.aijcrnet.com>.
- McCabe, B. J. (2014). When Property Values Rule. *Contexts*, 13(1), 38–43. <https://doi.org/10.1177/1536504214522007>
- McCabe, S., Rooke, J., Seymour, D., & Brown, P. (1998). *Quality Manager Authority & leadership, construction management & Economics*. 16(4), 447–457.
- Mensah, S., & Ameyaw, C. (2012). Sustainable procurement: The challenges of practice in the Ghanaian construction industry. *Proceedings of the 4th West*

Africa Built Environment Research (WABER) Conference, 871–880.

Mohsini, R. A., Sirpal, R., & Davidson, C. H. (1995). Procurement: A comparative analysis of construction management and traditional building processes. *Building Research & Information*, 23(5), 285–290.

<https://doi.org/10.1080/09613219508727477>

Naoum, S. (2003). An overview into the concept of partnering. *International Journal of Project Management*, 21(1), 71–76. [https://doi.org/10.1016/s0263-7863\(01\)00059-x](https://doi.org/10.1016/s0263-7863(01)00059-x)

Nwokoro, I., & Onukwube, H. N. (2011). Sustainable or Green Construction in Lagos, Nigeria: Principles, Attributes and Framework. *Journal of Sustainable Development*, 4(4). <https://doi.org/10.5539/jsd.v4n4p166>

Ogunba, O. A. (2004). EIA systems in Nigeria: evolution, current practice and shortcomings. *Environmental Impact Assessment Review*, 24(6), 643–660. <https://doi.org/10.1016/j.eiar.2003.10.019>

Ogunsanmi, O. (2012). Comparisons of Procurement Characteristics of Traditional and Labor-Only Procurements in Housing Projects in Nigeria. *Civil and Environmental Research*, 2(8). <https://doi.org/ISSN 2222-1719>

Ogunsanya, O. A., Aigbavboa, C. O., Thwala, D. W., & Edwards, D. J. (2019). Barriers to sustainable procurement in the Nigerian construction industry: an exploratory factor analysis. *International Journal of Construction Management*, 1–12. <https://doi.org/10.1080/15623599.2019.1658697>

Ojo, S. O., & Aina, O. O. (2010). Developing a Decision Support System for the Selection of Appropriate Procurement Method for a Building Project in Nigeria.

Global Journal of Researches in Engineering, 10(2), 18.

Okeola, O. G. (2009). *Occupational Health and Safety (OHS) Assessment in the Construction Industry*. 1st Annual Civil Engineering Conference, University of Ilorin, Nigeria.

Oyedele, O. A. (2013). *Construction project financing for sustainable development of Nigerian cities*. 1.

https://www.researchgate.net/publication/255792517_Construction_project_financing_for_sustainable_development_of_Nigerian_cities

Pawłowski, A. (2008). How many dimensions does sustainable development have? *Sustainable Development*, 16(2), 81–90. <https://doi.org/10.1002/sd.339>

Placet, M., Anderson, R. G., & Fowler, K. M. (2005). Strategies for Sustainability. *Research Technology Management*, 48(5), 32–41.

<https://doi.org/10.1080/08956308.2005.11657336>

Procura+. (2018). *Procura+ | CASE STUDIES*. Procuraplus.org.

<https://procuraplus.org/case-studies/>

Public Procurement Act. (2007).

Ruparathna, R., & Hewage, K. (2015). Sustainable procurement in the Canadian construction industry: current practices, drivers and opportunities. *Journal of Cleaner Production*, 109, 305–314. <https://doi.org/10.1016/j.jclepro.2015.07.007>

Rwelamila, P. D., Talukhaba, A. A., & Ngowi, A. B. (2000). Project procurement systems in the attainment of sustainable construction. *Sustainable Development*, 8(1), 39–50. [https://doi.org/10.1002/\(sici\)1099-1719\(200002\)8:1<39::aid-sd127>3.0.co;2-z](https://doi.org/10.1002/(sici)1099-1719(200002)8:1<39::aid-sd127>3.0.co;2-z)

- Silvius, A. J. G., Schipper, R. P. J., & Nedeski, S. (2013). *Sustainability in Project Management: Reality Bites*.
- Spangenberg, J. (2019). Scenarios and Indicators for Sustainable Development: Towards a Critical Assessment of Achievements and Challenges. *Sustainability*, 11(4), 942. <https://doi.org/10.3390/su11040942>
- Srdić, A., & Šelih, J. (2011). Integrated quality and sustainability assessment in construction: a conceptual model. *Technological and Economic Development of Economy*, 17(4), 611–626. <https://doi.org/10.3846/20294913.2011.603177>
- Tai, Y.-M., Ho, C.-F., & Wu, W.-H. (2009). The performance impact of implementing Web-based e-procurement systems. *International Journal of Production Research*, 48(18), 5397–5414. <https://doi.org/10.1080/00207540903117915>
- Tarí, J. J., & Molina-Azorín, J. F. (2010). Integration of quality management and environmental management systems: Similarities and the role of the EFQM model. *The TQM Journal*, 22(6), 687–701. <https://doi.org/10.1108/17542731011085348>
- TOOKEY, J. E., MURRAY, M., HARDCASTLE, C., & LANGFORD, D. (2001). Construction procurement routes: re-defining the contours of construction procurement. *Engineering, Construction and Architectural Management*, 8(1), 20–30. <https://doi.org/10.1108/eb021167>
- UK Sustainable Task Force. (2006). *Procuring the Future*. Sustainable Procurement National Action Plan: Recommendations from the Sustainable Procurement Task Force
- UNEP. (2021). *Sustainable Public Procurement: How to Wake the Sleeping Giant!*

- Introducing the United Nations Environment Programme's Approach* (pp. 15–28).
- Van de Ven, A., & Poole, M. S. (1995). Explaining Development and Change in Organizations. *The Academy of Management Review*, 20(3), 510–540. JSTOR. <https://doi.org/10.2307/258786>
- Varnäs, A., Balfors, B., & Faith-Ell, C. (2009). Environmental consideration in procurement of construction contracts: current practice, problems and opportunities in green procurement in the Swedish construction industry. *Journal of Cleaner Production*, 17(13), 1214–1222. <https://doi.org/10.1016/j.jclepro.2009.04.001>
- Wahab, A. B. (2010). Stress Management among Artisans in Construction Industry in Nigeria. *Global Research of Engineering*, 10(1).
- Walker, D. H. T., & Rowlinson, S. (2008). *Procurement system; a cross-industry perspective*. Abingdon, Oxon.
- Walker, H., & Phillips, W. (2009). Sustainable procurement: emerging issues. *International Journal of Procurement Management*, 2(1), 41. <https://doi.org/10.1504/ijpm.2009.021729>
- WCED. (1987). *Our Common Future: Report of the World Commission on Environment and Development* (pp. 10–57). United Nations.
- Williams, C. C., & Millington, A. C. (2004). The diverse and contested meanings of sustainable development. *The Geographical Journal*, 170(2), 99–104.
- World Atlas. (2021). *Nigeria Maps & Facts*. WorldAtlas. <https://www.worldatlas.com/maps/nigeria>
- World Bank. (2019). *Sustainable Procurement: An introduction for practitioners to*

- sustainable procurement in World Bank IPF projects* (pp. 2–14). The World Bank USA. www.worldbank.org
- World Bank. (2020). *Population, total - Nigeria | Data*. Data.worldbank.org.
<https://data.worldbank.org/indicator/SP.POP.TOTL?end=2020&locations=NG&start=1960&view=chart>
- Yuni, N. K. S. E., Norken, I. N., Sudarsana, D. K., & Adnyana, I. B. P. (2017). Risk Analysis of Tender Documents on the Execution of Private Construction Work at Badung Regency, Bali Province, Indonesia. *Journal of Sustainable Development*, 10(4), 130. <https://doi.org/10.5539/jsd.v10n4p130>
- Zhang, X., Shen, L., Wu, Y., & Qi, G. (2011). Barriers to Implement Green Strategy in the Process of Developing Real Estate Projects. *The Open Waste Management Journal*, 4(1), 33–37. <https://doi.org/10.2174/1876400201104010033>
- Zhyzhneuski, A. (2014). *Partnering as a new procurement approach for construction industry*. <http://www.academia.com>
- Zink, K. J. (2007). From total quality management to corporate sustainability based on a stakeholder management. *Journal of Management History*, 13(4), 394–401.
<https://doi.org/10.1108/17511340710819615>