

**AN INVESTIGATION INTO THE BARRIERS AND DRIVERS OF
SUSTAINABLE CONSTRUCTION IN UGANDA**

BY

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DECLARATION

I, **Lugya Duncan**, hereby assert and affirm that the work presented in this submission is entirely original and has been conducted by me. Furthermore, I declare, with utmost confidence and knowledge, that no substantial portion of this work has been previously authored or published by any other individual or scholar, nor has it been submitted and accepted for the attainment of any other academic degree from any university or institute of higher learning. In instances where external sources have been utilized, proper acknowledgment has been provided within the text and in the reference list.

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APPROVAL

The undersigned supervisors hereby confirm their guidance, review, approval, and recommendation for acceptance of the research dissertation titled “**An investigation into the barriers and drivers of sustainable construction in Uganda**” by Kyambogo University. This dissertation fulfills the necessary criteria for the award of a Master of Science degree in Construction Technology and Management from Kyambogo University.

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Signature: _____ Date: _____

DR. SAM BULOLO

DEDICATION

I dedicate this dissertation to my parents, wife and daughters Darielle and Divine, who have been the central pillars of focus in this research endeavor. May God bless you!

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I begin by conveying my deeply felt gratitude to the divine providence for granting me good health, enabling me to pursue my studies. I am also thankful for the financial opportunities that have made it possible for me to afford university tuition. All honor and praise are attributed to Him.

I spread out my acknowledgement to the individuals that have played a notable role in ensuring completion of this research project, to whom I am highly indebted.

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LIST OF ABBREVIATIONS AND ACRONYMS

%	Percentage
CAHF	Centre for Affordable Housing in Africa
CO ₂	Carbon dioxide
DAP	Development Approval Process
EC	Embedded Carbon
GDP	Gross Domestic Product
ISU	Institute of Surveyors of Uganda
NAPE	National Association of Professional Environmentalists
NDP	National Development Plan
SC	Sustainable Construction
SS	Statistical Significance
UBOS	Uganda Bureau of Statistics
UIPE	Uganda Institute of Professional Engineers
UNEP	United Nations Environment Program
UNESCO	United Nations Educational Scientific and Cultural Organization
US \$	United States Dollar
USA	Uganda Society of Architects

ABSTRACT

This study investigated the barriers and drivers to Sustainable Construction (SC) in Uganda, with the aim of developing a framework to promote its wider adoption. The construction industry has immensely contributed to the development of the economy. However, the impact to the environment arising from construction activities is significant. Despite increasing awareness among construction professionals, limited empirical data exists on the specific barriers and enablers of SC adoption in Uganda necessitating this investigation. Questionnaires were administered to 173 construction professionals (civil engineers, architects, surveyors, and environmentalists) primarily based in Kampala and Wakiso. The research adopted both quantitative and qualitative research approaches. The data collected were analyzed quantitatively using SPSS and variables with Relative Importance Index (RII) greater than 0.8 were considered critical barriers and drivers. The findings revealed several barriers to SC, including limited market demand (RII: 0.90), limited public awareness about SC (RII: 0.86) among others. In terms of drivers, factors, such as reduction in natural resource use (RII: 0.84) and providing SC measurement (RII: 0.83) were found to motivate the adoption of SC. The study further assessed the level of awareness and interpretation of SC, highlighting the need for increased education on the benefits of SC. Based on the results, a framework was proposed, emphasizing the importance of government incentives and collaboration with stakeholders. The study provides valuable insights for promoting the wider adoption of SC in Uganda and lays the groundwork for future research and policy development.

Keywords: Sustainable Construction, professionals, barriers, drivers, Uganda.

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Construction activities exert environmental impacts throughout the entire lifecycle of a building development—from initial site preparation and construction to operation and eventual demolition (Ametepey & Ansah, 2014). These impacts are significant, with the construction sector contributing approximately 35–40% of global CO₂ emissions, consuming 40% of raw material inputs, and using 16% of the world's water resources in construction and related processes (Durdyev et al., 2018)

In Africa, in 2018, buildings contributed 61 percent of Africa's final energy consumption and 32 percent of CO₂ emissions (UNEP, 2022). In Uganda, large quantities of trees are harvested every year for use in construction activities, which leads to environmental degradation (UNESCO, 2016). However, it is possible that the negative environmental effects could be reduced or eliminated if the construction industry adopts sustainable construction (SC) methods of construction (Djokoto et al., 2014).

While many studies address environmental challenges in construction, research specifically focused on the Ugandan context, particularly in line with a framework for adoption of SC is limited. According to Kibwami and Tutesigensi (2016), integrating embedded carbon (EC) into the development approval process (DAP) for building projects in Uganda can improve sustainable construction. However, their research acknowledges that the specific factors that contribute to barriers to SC are not adequately addressed in

the existing DAP. This means that while the EC analysis itself is beneficial, more work is needed to understand and address the root causes of why SC practices are not fully adopted in the Ugandan building sector.

It is therefore essential to identify the drivers and barriers affecting the adoption of SC in Uganda, despite the reportedly high levels of awareness among construction professionals.

1.2 Problem statement

The construction industry with all its sub-sectors have made an immense contribution to the growth of the economy through enabling the achievement of various development objectives including generation of income, employment creation, regeneration etc. This development ought to be achieved with minimal or no negative effects.

However, with all its positive contributions to the growth and development of the country, the industry has also made significant negative impacts to the environment. Available statistics indicate that globally in 2021, emissions of CO₂ from building related activities reached an all-time high of close to 10 GtCO₂ (UNEP,2022).

The negative impact to the environment has led to a number of problems including landslides, global warming, drought etc. In a recent study carried out in Bugisu Sub-region, 167 out of 180 respondents revealed that landslides occurrences in the area are due to clearing of forests for different purposes, including construction activities (UNESCO, 2016).

To minimize the impact to environment by construction and its related activities, there is need to embrace SC. However, studies in line with this context, specifically a framework for the promotion of the adoption of SC in Uganda are limited. Existing research highlights that the existing DAP in Uganda does not adequately address the specific factors that contribute to barriers to SC (Kibwami and Tutesingesi, 2016), implying that more effort is needed to understand the barriers to the adoption, and any drivers to the promotion of the adoption of SC in Uganda.

1.3 Research Objectives

1.3.1 Main Objective

The main objective of the study was to develop strategies for promotion of a wider adoption of Sustainable Construction in Uganda.

1.3.2 Specific Objectives

The specific objectives of the study are;

- (i) To establish the level of awareness and interpretation of Sustainable Construction in Uganda.
- (ii) To determine the barriers to Sustainable Construction in Uganda.
- (iii) To explore the drivers of Sustainable Construction in Uganda.
- (iv) To develop a framework to promote wider adoption of Sustainable Construction in Uganda.

1.4 Research Questions

The research questions of the study are;

- (i) What is the level of awareness and interpretation of Sustainable Construction in Uganda?
- (ii) What are the barriers to Sustainable Construction in Uganda?
- (iii) What are the drivers of Sustainable Construction in Uganda?
- (iv) Which framework can promote the wider adoption of Sustainable Construction in Uganda?

1.5 Justification of the Study

Uganda as a developing country is undertaking numerous developments in the construction sector which are associated with high negative impact on environment, economy and communities. A study reported that the embodied energy of fired clay bricks in Uganda as compared to developed countries is 5.7 times higher (Hashemi et al.,2015). There is therefore a need to promote a wider adoption of environmentally friendly construction practices, thus the need for research about SC. Additionally, in Uganda, few studies have been carried out on this topic, thus creating a need to deeply explore, hence the study.

1.6 Significance of the Study

The study findings if adopted shall enable enhancement of SC practices in Uganda at large. This will to a large extent help in reducing the destructive impacts to the environment by construction and related activities. Academically, the study will help in bridging the

knowledge gap of how to enhance SC practices in Uganda. It will also offer guidance on future research and studies on the topic of SC in Uganda.

1.7 Study Scope

1.7.1 Content Scope

The study focused on the barriers and drivers affecting the adoption of SC in Uganda, in terms of the environmental, social and economic sustainability. The study cut across the entire construction sub-sector including buildings, roads and the water sub-sector. This is because, according to the Economic Policy Research Centre, approximately US\$ 1 billion is spent annually in Uganda on infrastructure, which is an equivalent of close to 11 per cent of her GDP, with the greatest bulk of this taken up by the roads/ bridges and building sub-sectors.

1.7.2 Geographical Scope

The study area was Uganda, with particular emphasis on areas with high volume of construction activity like Kampala and Wakiso.

1.7.3 Time Scope

The study period was 15 months (November 2022 to March 2024).

1.8 Conceptual framework

A conceptual framework shows an illustration of the relationship between the study variables. It shows the objectives for the research process and indicates out how they relate to draw coherent conclusions. Figure 1.1 is the conceptual framework that was adopted for this study.

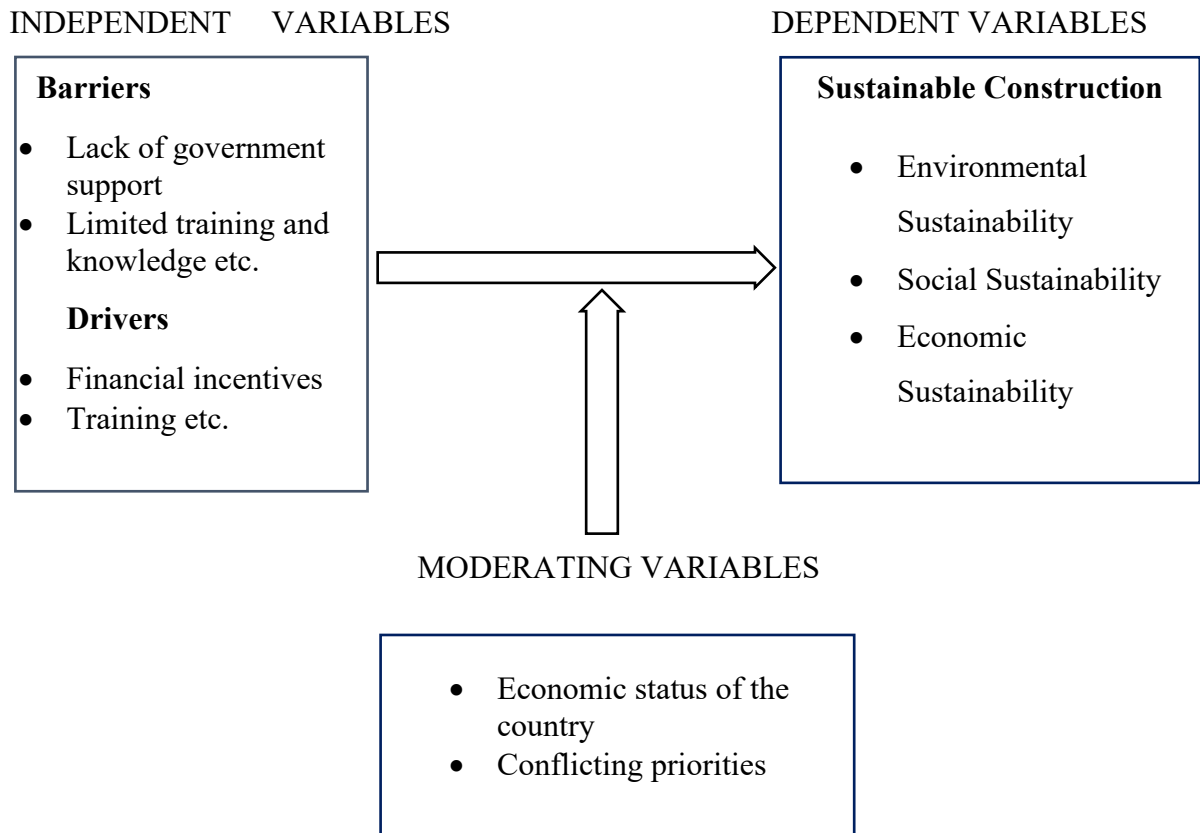


Fig 1.1: Conceptual framework

1.9 Chapter Summary

The chapter highlights the background, problem statement, key objectives of the research, its justification, scope and significance to academia and society in general. The next chapter highlights the key literature that was reviewed for purposes of this study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter focused on the key literature reviewed for purposes of obtaining a detailed understanding of the topic and what other researchers did concerning the topic under study.

2.2 Sustainable Construction

The idea of “sustainability” was first defined by the prime minister of Norway, Gro Brundtland, who authored the Brundtland report, published by United Nations of the World Commission on Environment and Development in 1989. This report has been a central component of several studies and practices (Yilmaz and Bakis, 2015; Ogunmakinde et al.,2022). Brundtland defined sustainability as "leaving sufficient resources for future generations to have a quality of life similar to ours" (Kibert, 1994). Generally, sustainability refers to the use of natural resources in such a manner that they do not reach an unrenowable point, decay or depletion and ensuring that the next generations are not disadvantaged (Yilmaz and Bakis, 2015).

Sustainability in construction can further be explained as the incorporation of sustainable development principles to construction (Kibwami and Tutesingesi, 2016). It can also be defined as the application of sustainable development principles to the life cycle of a building from planning to demolition. (Yilmaz & Bakis, 2015). At the First International Conference on Sustainable Construction held in November 1994 in Tampa, Florida, USA,

sustainable construction was defined as, “Creating a healthy built environment using resource-efficient, ecologically-based principles” (Hussin et al., 2013).

Sustainable construction involves a commitment to:

i) Social sustainability – being responsive to the needs of people at all stages of the construction process (from planning to demolition), working closely with all stakeholders (local communities, employees, suppliers, and clients) so as to ensure high customer satisfaction.

ii) Economic sustainability – efficient utilization of resources including materials, labor, water and energy, thus leading to increased profitability.

iii) Environmental sustainability – careful utilization of natural resources, enhancing and protecting the environment and minimizing waste, thus preventing irreversible effects to the environment (Hussin et al., 2013).

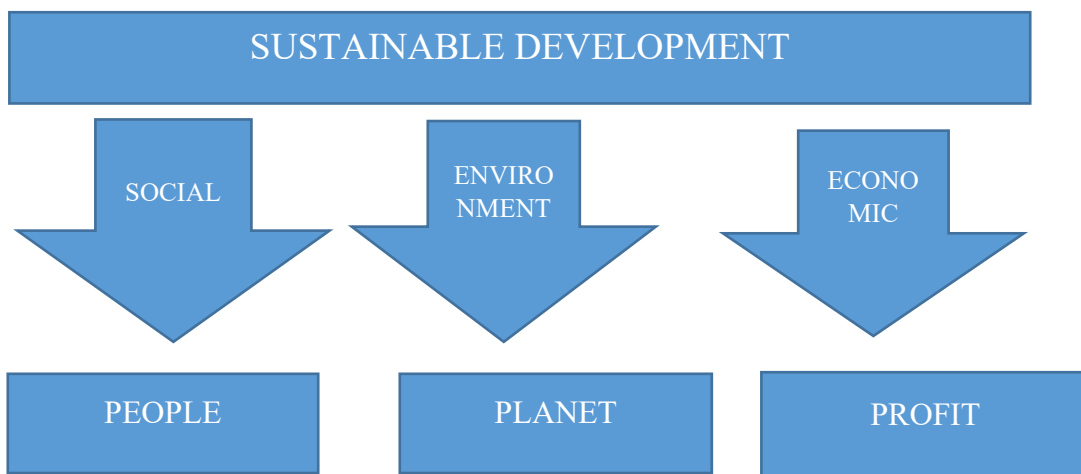


Figure 2.1: The three pillars of sustainability and the triple bottom line view of sustainability

Source: Brennan (2015)

Figure 2.1 shows an illustration of the sustainability concept using the three pillars model. It equally illustrates the linkage of the model to the triple bottom line view of sustainability. If organizations and companies are to be enticed in to sustainability, it should be achieved whilst achieving profitability. The three pillars model illustrates how this can be achieved (Brennan, 2015). Whereas traditional design and construction entirely focuses on the objectives of quality, cost and performance, sustainability in design and construction further considers reduced damage to the environment, reduction in the depletion of resources and creating a healthy built environment (Kibert, 1994).

Table 2.1: Traditional and sustainability criteria for building materials, products, and systems

TRADITIONAL CONSTRUCTION	SUSTAINABLE CONSTRUCTION
<ul style="list-style-type: none"> • Performance 	<ul style="list-style-type: none"> • Resource depletion
<ul style="list-style-type: none"> • Cost 	<ul style="list-style-type: none"> • Healthy environment
<ul style="list-style-type: none"> • Quality 	<ul style="list-style-type: none"> • Environmental degradation

Source: Kibert (1994)

2.3 Principles of Sustainable Construction

There are six (6) principles of SC as reported by many researchers. These principles apply to the entire life span of a building, spanning from the planning phase to demolition. The principles further extend to the resources (ecosystems, building materials, land, energy, water, and ecosystems) required to create and operate the built environment during its whole life span (Davies and Davies, 2017). These include;

- (i) Minimize resource consumption (Conserve)
- (ii) Maximize resource reuse (Reuse)
- (iii) Use renewable or recyclable resources (Renew/Recycle)
- (iv) Create a healthy, non-toxic environment (non-toxics)
- (v) Protect the natural environment (Protect Nature)
- (vi) Pursue quality in creating the built environment (Quality) (Kibert, 1994; Emere et al., 2023; Davies and Davies, 2017).

2.4 Barriers to sustainable construction

Barriers refer to obstructions or hindrances to an operation. They can also be referred to as situations that hinder actions and/or progress towards particular goals or objectives. (Osuizugbo et al., 2020). Literature review revealed many barriers hindering the embracing of SC in developing countries, Africa and the world at large. For this study, the identified barriers in the literature review can generally be categorized as indicated below.

2.4.1 Governance/Institutional barriers

Lack of or insufficient government support towards the promotion and adoption of SC is a great barrier to SC in developing countries. This is coupled with inefficient building codes and regulations, which mostly benefit conventional methods of construction as opposed to SC techniques. Legal prohibitions and bans on sustainable materials and technologies has also hindered SC adoption. Also, the weak enforcement of regulations

and laws established to enforce the adoption of SC techniques has enabled developers to stick to conventional construction methods. Further still, there is no clear strategy for promotion of SC in many developing countries. Even when the developers choose to undertake SC techniques, the procedures to obtain the necessary approvals is cumbersome and time consuming, thus forcing them to resort to conventional methods of construction. Furthermore, governments have not offered any incentives to developers as a means of enticing them towards SC. Finally, the conflicting government priorities including poverty eradication, education for all, health etc., most especially in developing countries, has made SC a less priority as compared to others (Davies and Davies, 2017; Dalirazar et al., 2020; Tokbolat et al., 2020; Zulu et al., 2022; Djokoto et al., 2014; Durdyev et al, 2018; Nikyema and Blouin, 2020).

2.4.2 Economic barriers

SC is associated with higher investment cost in terms of materials, special storage, equipment, operation and long construction periods. Secondly, due to lack of familiarity, there are higher chances of cost estimates inaccuracy/ uncertainty which might lead to losses. Also, the benefits of SC are not instant. The long payback period has also proven to be a barrier to SC. Furthermore, the lack of financing schemes from financial institutions to support SC has also barred developers from adopting it. Finally, there are limited local suppliers of sustainable building materials thus the need for importation of materials and technologies from suppliers in foreign markets (Tokbolat et al., 2020; Zulu

et al., 2022; Nikyema and Goulwendin, 2020; Dalirazar et al., 2020; Davies and Davies, 2017).

2.4.3 Social/cultural barriers

The limited public awareness coupled with limited knowledge and information about SC has hindered its adoption. This is coupled with the limited demand from the market including companies and society. Further still, change resistance from conventional to sustainable buildings by the various stakeholders has further become a barrier to its adoption. The limited knowledge of the benefits of SC practices has also made the developers reluctant to adopt it (Davies and Davies, 2017; Djokoto et al., 2014; Zulu et al., 2022; Nikyema and Blouin, 2020; Tokbolat et al., 2020; Ohiomah, 2020).

2.4.4 Professional barriers

The limited professional knowledge and expertise on SC amongst the construction professionals is a barrier to its adoption. This is coupled with a lack of and limited knowledge of technologies used in SC. Further still, the increased documentation that comes along with SC practices has also hindered its adoption. The lack of projects executed using SC techniques to serve as demonstrations to the construction professionals has also hindered its adoption. The lack of demonstrations has further created an uncertainty of long-term performance of sustainable projects. Also, the lack of necessary reference database and information on SC to offer guidance to the professionals during design and execution of sustainable projects has made it hard to adopt the concept. Inadequate training / education and international SC design standards not being adapted

to fit local needs (Dalirazar et al., 2020; Tokbolat et al., 2020; Zulu et al., 2022; Nikyema and Blouin, 2020; Djokoto et al., 2014).

2.5 Drivers to Sustainable Construction

Drivers are practices that when implemented can stimulate the promotion of SC practices. They include the possible gains, actions and resolutions that entice stakeholders into implementation of SC (Oke et al., 2019). In this study, the drivers to sustainable construction have been categorized into environmental, economic and social barriers.

2.5.1 Environmental drivers

The ability of SC to cause a reduction in the utilization of natural resources including water, materials, energy etc. can be a great factor that drives construction professionals towards adopting SC. This is coupled with its ability to allow for the recycling and re-use of products to avoid wastage and reduce wastes arising from construction projects, improving indoor environmental quality and improving the water efficiency of buildings in terms of usage. The use of renewable resources as opposed to non-renewables resources to prevent depletion can also drive masses towards SC. Also, the ability to minimize pollutants that cause environmental degradation, during and after construction was identified as one of the drivers to SC. Providing sustainable construction measurement and voluntary rating/ certification as a means of measuring the sustainability of each construction project will force developers into sustainability. The greater availability and affordability of sustainable construction materials on our local markets will also drive professionals towards sustainability. Also, the development of comprehensive data bases

to offer guidance and create a reference to professionals during design and project implementation will enable them to adopt SC practices. Finally, the enforcement of compliance of established environmental regulations geared towards ensuring sustainability is a great driver to SC (Kibwami and Tutesingesi, 2016; Dalirazar et al., 2020; Tokbolat et al., 2020; Durdyev, et al., 2018).

2.5.2 Economic drivers

The economic drivers to SC include; the financial affordability of sustainable projects by the society, the ability of sustainable projects to create employment opportunities to the local population, the ability of SC techniques to enhance the market value and marketability of buildings and thus influencing a high return on investment. This is coupled with choosing environmentally compliant suppliers/contractors during the procurement process, providing incentives in terms of tax holiday, cash incentives etc. to those applying a sustainability measure and utilizing local resources including labor and materials during construction (Tokbolat et al., 2020; Kibwami and Tutesingesi, 2016; Durdyev et al., 2018; Dosumu, 2021).

2.5.3 Social drivers

The ability of SC to cause poverty alleviation through the creation of employment opportunities, increased income, etc. can be an effective driver towards SC. This coupled with increased health and safety at workplace, operations of a sustainable buildings being compatible with the local needs of the society and ensuring an increased demand for environmentally friendly buildings through sensitization of the developers concerning the

benefits of sustainable buildings. This can be achieved through increased education and training to construction professionals on SC to increase awareness, developing capacity, skills and policy monitoring systems to ensure compliance. Finally, improving government support through establishing policies and regulations directed towards enhancing SC can also drive the population towards SC (Dosumu, 2021; Tokbolat et al., 2020; Kibwami and Tutesingesi, 2016; Djokoto et al., 2014).

2.6 Sustainable Construction frameworks

Generally, a framework is a conceptual or real structure aimed at serving as a support or guide for developing something that expands that structure into a useful innovation (Oke et al., 2019). A framework is developed after establishing that there are factors hindering the promotion of SC in Uganda.

2.6.1 A strategic framework for sustainable construction in developing countries

A study carried out in South Africa by Du Plessis (2007), developed a framework to guide the promotion of SC practices. The study reported three multi-dimensional and interdependent enablers that promote wider adoption of SC in developing countries. These are technological enablers, institutional enablers and enablers related with value systems. They describe both how things are valued and the social, spiritual or moral values that guide decisions (Du Plessis, 2007). These enablers are informed by global and local environmental considerations. These human needs and environmental limits foster the development of value systems that further help in determining the way of forging the relationship between protecting the integrity of the biosphere and meeting human needs.

The value system enablers guide the development of the technological and institutional enablers and further guide stakeholder action.

Table 2.2: Strategic framework for promotion of SC in developing countries

Time	Technological	Institutional	Values
Immediate	<ul style="list-style-type: none"> • Bench marking and assessment. • Knowledge systems and data capturing. 	<ul style="list-style-type: none"> • Clarified roles and responsibilities. • Education. • Cooperation and partnership. • Advocacy and awareness. 	<ul style="list-style-type: none"> • Understanding the drivers. • Mapping the route to change. • Re-evaluating heritage.
Medium	<ul style="list-style-type: none"> • Technologies to mitigate impact. 	<ul style="list-style-type: none"> • Linking research to implementation. • Develop regulatory mechanisms. 	<ul style="list-style-type: none"> • Develop a new way of measuring value and reward. • Develop codes of conduct.
Long term	<ul style="list-style-type: none"> • Technologies for the future. • Changing the construction process. 	<ul style="list-style-type: none"> • Strengthening implementing mechanisms. • Using institutions as drivers. 	<ul style="list-style-type: none"> • Corporate social responsibility reporting.

Source: Du Plessis (2007)

2.6.1.1 Technology enablers

These fall under three categories;

- Hard technology related to industrial processes, equipment, materials and physical infrastructure solutions.
- Soft technology such as systems, mental models and those tools (ICT-based or otherwise) that support monitoring, evaluation and decision making.
- Knowledge and information (e.g. indigenous knowledge systems, databases, guidelines and manuals, benchmarks and hand- books).

2.6.1.2 Institutional enablers

Unless supported by processes for transfer of technology, technology by itself is useless. Functioning institutions facilitate the uptake of new technologies. To put in place an environment that enables SC, institutions such as academic and research institutions, development agencies, the different levels of government, professional associations and non-governmental organizations should take up sustainable development and all its principles as a critical component of everything they do, and also increase their own capacity to support SC and the technology associated to it.

2.6.1.3 Value system enablers

After creating an enabling environment, people will have to make a choice to take on technologies that make use of the created opportunities. The society's shift towards sustainability will be determined by the group and individual decisions regarding their

behavior. Sustainable development requires a change in attitude and behavior, and this can only be achieved through personal commitment.

While the framework effectively identifies general enablers for SC promotion, it fails to address the specific challenges and barriers unique to the Ugandan context, and may therefore not be as effective as it could be in promoting SC within Uganda.

2.6.2 Framework for promotion of SC in Jordan

Ali and Alkayed (2019) in their study carried out in Jordan developed a framework for promotion of SC. The theoretical pillars on which the framework is based are:

- Attaining SC implementation in professional practice requires institutional organizational work led by major institutions.
- Achievement of the implementation of the SC concept in professional practice requires structured work, starting from the top to bottom (from the national level to the executive level).
- Achievement of the concept of sustainable construction in professional practice requires a collective effort around common objectives, that define and distribute the roles and responsibilities amongst different stakeholders.

To ensure effective implementation of sustainable building practices, four main categories are required to work in an integral manner. Government institutions form the first sector, whose role include coordination of efforts and follow-up, strategic leadership and control, strategic planning, codes, laws and regulations. The creation of incentives to compliant developers and penalties to violators and funding of research.

Academic and research institutions form the second category. Their roles include rehabilitating graduates and carrying out research on practices, materials and techniques.

The professional and industrial group form the third category. Their roles include supervising and organizing, training, rehabilitating professionals, awareness- raising, support etc.

The final category is the private sector institutions who play the role of manufacturing and supplying building materials, developing objectives and programs of projects, investing in sustainable buildings and materials, activating market movement etc.

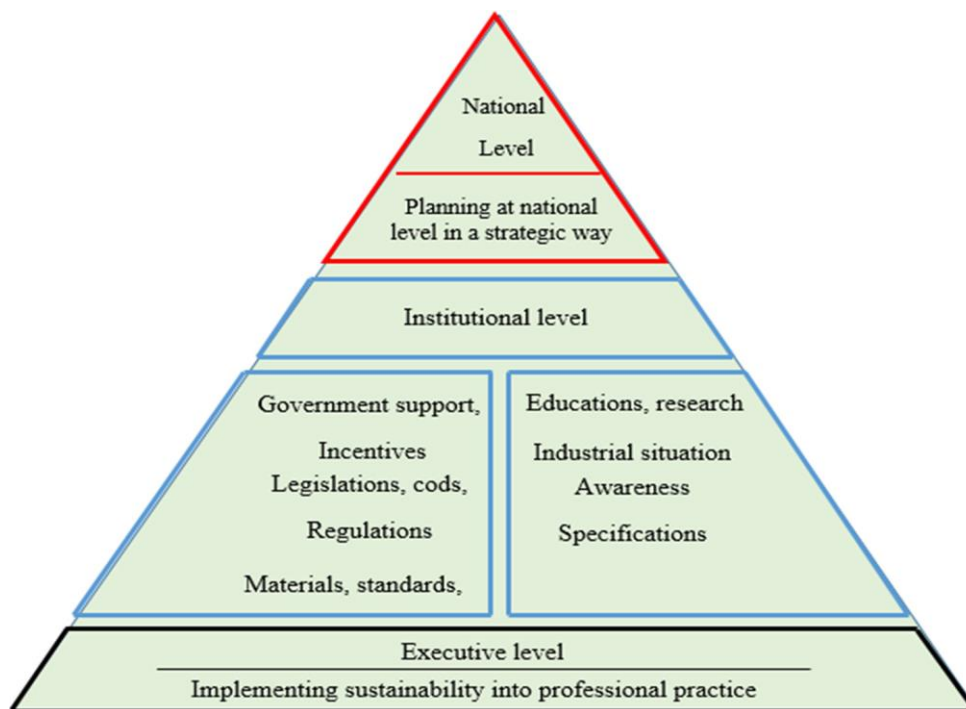


Figure 2.2: A framework for promotion of SC in Jordan

Source: Ali and Alkayed (2019)

The framework was developed in response to the critical hindrances to sustainable construction in Jordan. However, since these hindrances are often country-specific reflecting the unique challenges each nation faces, its effectiveness in the context of Uganda may be limited.

2.6.3 Framework for promotion of SC in Malaysia

Idrisa et al. (2015) in their study carried out in Malaysia, developed a framework to guide promotion of SC practices. The framework centered on government as the lead in promoting SC and ensuring its practice in Malaysia. The roles of government in ensuring increased SC practice were summarized into three;

- Increasing awareness of SC amongst the public and private sectors.

The framework suggests that this can be achieved through organizing conferences and exhibitions on SC, organizing workshops on how to adopt SC into practice and collaborating with construction partners to improve sustainable practices.

- Subsidizing costs of implementing SC.

The framework proposes that this can be achieved through setting up a SC construction fund aimed at providing financing to sustainable projects, coupled with giving tax incentives to users.

- Resolving the limitations of green product suppliers.

This can be through providing financial incentives to available local suppliers and encouraging them to take on the supply of green products.

The framework further guides that governments must initiate and develop SC practices and environmental policy plans so as to define sustainability goals for future years. This can be evidenced in countries such as Japan, Hong Kong and Singapore where governments are leading in promoting SC.

The framework focuses solely on the role of governments in promoting sustainable construction. However, achieving SC in Uganda requires coordinated efforts from multiple stakeholders within the construction sector. As a result, the framework is less effective when applied to the Ugandan context.

2.7 Theoretical review

This study draws on three key theories to provide a conceptual foundation for understanding the barriers and drivers of sustainable construction (SC) in Uganda:

Diffusion of Innovations Theory explains the slow adoption of SC practices by highlighting factors such as perceived complexity, low awareness, and limited demonstration of benefits. It emphasizes the role of early adopters and change agents in influencing uptake (Rogers et al., 2014).

Institutional Theory helps examine systemic barriers, such as weak policy frameworks and conflicting governmental priorities. It underscores how regulatory, normative, and cultural forces shape organizational behaviour toward or against SC (Scott, 2001).

Stakeholder Theory highlights the importance of inclusive stakeholder engagement. It supports the need for coordinated roles and shared responsibilities among actors across the construction sector to promote SC adoption (Freeman and Phillips, 2002).

2.8 Chapter summary

This chapter discussed the key literature from other studies, related to this particular study.

The literature has been chronologically arranged in line with the specific objectives of the study. The next chapter discusses the methods and processes that were used in carrying out the study.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

The chapter explains the steps that were taken in implementing the study, including the design, respondents, tools etc.

3.2 Research design and approach

3.2.1 Research design

A number of designs are reported in literature including experimental (this is used to determine if there is a causal relationship between two or more variables), exploratory (approach that investigates research questions that have not previously been studied in depth), analytical (a specific type of research that involves critical thinking skills and the evaluation of facts and information relative to the research being conducted), descriptive (involves observing and collecting data on a given topic without attempting to infer cause and effect relationships), and correlational research designs (investigates relationships between variables without the researcher controlling or manipulating any of them). For this study, a descriptive research design was used. This is because the researcher intended to determine and describe the variables under study i.e. the barriers and drivers to sustainable construction.

3.2.2 Research Approach

The study adopted both quantitative and qualitative research approach. This is because the researcher intended to obtain an expert view of the barriers and drivers to SC in Uganda and then carry out a numerical comparison of the various barriers and drivers so as to

obtain a logical understanding of their relative impact on SC, based on the judgment of the research participants.

3.3 Population and sample

3.3.1 Population

The population comprised of professionals (architects, engineers, surveyors and environmentalists) in the construction industry. These professionals are responsible for making decisions and implementing the activities in construction projects. This implies that they have a high knowledge of the realities on ground, cultures, standards and practices that are commonly utilized in the industry in Uganda. This means a very important asset in establishing practical and efficient drivers and barriers to SC (Tokbolat et al.,2018).

3.3.2 Sample and sampling strategies

Both non-probability and probability sampling techniques were adopted in establishing a sample to ensure that it was representative of the targeted population. In probability sampling, stratified sampling was used to select samples from each stratum, a professional body i.e. Uganda Society of Architects (USA), Uganda Institute of Professional Engineers (UIPE), Institute of Surveyors of Uganda (ISU) and National Association of Private Environmentalists (NAPE) to ensure that all construction professionals were well represented. Simple random sampling was then conducted on the stratified samples so that every member in the stratified sample gets a chance to be selected. In non-probability sampling, specifically purposive sampling was employed, where members/samples were

selected from the selected organizations and projects in the study area for a specific purpose.

3.3.3 Sample size

Both stratified random sampling and purposive sampling were used. Stratified random sampling was adopted for selection of members of the respective professional bodies to participate in the study. Purposive sampling was employed, where respondents were selected from the selected organizations and projects in the study area for a specific purpose. Selection depended on the individuals' education background, experience and their level and extent of involvement in managing the project. In obtaining the sample size of participants, the equation which gave a scientific procedure for determining sample size was used. The equation was stated below:

$$SS = Z^2 \times P \times (1 - P) / C^2 \text{ (Freiman et al.,2019) ----- (Equation 3.1)}$$

Where;

SS = Sample size

Z = Z value (e.g., 1.96 for 95% confidence level)

P = Percentage using a choice expressed as a decimal (0.50 to be used for sample size needed)

C = margin of error (9%)

$$SS = (1.96^2 \times 0.5 \times 0.5) / 0.09^2 = 194.57 \text{ (Approx. 195)}$$

For this study, a sample size of 195 participants was adopted.

Data from the different construction sites sampled indicated that the number of the various construction professionals directly involved in construction activities varies. The civil

engineers occupied the biggest percentage, followed by architects, surveyors and lastly environmentalists. The researcher therefore found it appropriate that the biggest percentage of respondents should be from the civil engineering field. According to the researcher’s judgement, the sample size was distributed amongst the various professionals as indicated in table 3.1;

Table 3.1: Sample size distribution amongst the various professions

Profession	Percentage	Sample size
Civil engineers	50	98
Architects	20	39
Surveyors	15	29
Environmentalists	15	29
Total		195

3.4 Description of the study area

The study was implemented in Uganda, with particular emphasis on areas within Kampala Capital City Authority and Wakiso District Local Government. This is because these areas currently have a high concentration of multi-million construction projects as compared to other parts of the country by both government agencies and private developers.

3.5 Data Collection Instruments

The different data collection instruments include; checklists, interviews guides, questionnaires, etc. Data was obtained through structured questionnaires and interview guides to obtain the information relevant to this study.

3.5.1 Questionnaires

This was the main data collection instrument. It was employed because of the advantages it has for the study including, increased time saving, more endured confidentiality and it thus emerges as the best source of primary data. Both open and closed ended questions were developed in line with the study objectives and literature review. This helped in the expression of different people's views and opinions and ensure a wide coverage of opinions from the respondents.

3.5.2 Interview guides

An interview guide was used to collect qualitative data from the study respondents about the barriers and drivers to SC in Uganda, and the requirements for the framework for promotion of SC in Uganda. The interview guide was used because it allows for the collection of in-depth qualitative data on the topic under investigation.

3.6 Data Validity and Reliability

Validity is the accuracy of the instrument to measure what it was intended to measure (Mugenda and Mugenda, 2003). Pilot studies ensured that data collected was valid and more reliable. Ten respondents were used to carry out pilot studies with an aim of checking the validity and reliability of the questionnaire before the main survey. The researcher sought for guidance from the supervisors to ascertain the face validity of the instrument. Content validity was ascertained using the Content Validity Ratio (CVR) given by equation 3.2 and the results compared to the minimum CVR as indicated in the Lawshe table to determine the validity.

$$\text{CVR} = (N_e - N/2) \div N/2 \text{ ----- (Equation 3.2)}$$

Where;

N is the total number of respondents involved in the pilot study

N_e is the number of respondents indicating a particular measurement item is “essential”

Table 3.2: Data collection instrument validity analysis

S/No.	Variable	N	N_e	Calculated CVR	Minimum CVR (From Lawshe’s table)
1	Level of awareness and interpretation of SC	10	8	0.8	0.62
2	Barriers to SC in Uganda	10	10	1	0.62
3	Drivers of SC in Uganda	10	10	1	0.62
AVERAGE CVR				0.93	0.62

According to Lawshe table, if the number of respondents involved in the pilot study are 10, the minimum CVR value expected is 0.62. Therefore, the values obtained in the pretest of the instrument indicated that the contents were valid and the instruments were thus relevant to the study.

A reliable measurement is one which gives similar results for repeated applications. If the instrument gives different results, then the result is unreliable (Mugenda and Mugenda,

2003). The questionnaire was subjected to 10 respondents to measure the level of reliability. Using Chronbach's α equation, the reliability of the results was obtained by calculating the Chronbach's α value. According to the table for Chronbach's α value by Anastasi, (1985), if the Chronbach's alpha coefficient is greater than 0.8 and less than 0.9, the coefficient is considered good. Basing on the results, the instrument was considered reliable, dependable and yielded good results as shown in Table 3.3.

$$\text{Chronbach's } \alpha = 2[1 - (\alpha^2_{\text{odd}} + \alpha^2_{\text{even}})] \alpha^2_{\text{total}} \text{ ----- (Equation 3.3)}$$

Where;

α^2_{odd} is the standard deviation of odd items

α^2_{even} is the standard deviation of even items

α^2_{total} is the standard deviation of odd items

Table 3.3: Data collection instrument reliability analysis

S/No.	Variable	Chronbach's alpha coefficient	Remark
1	Level of awareness and interpretation of SC	0.834	Good
2	Barriers to SC in Uganda	0.875	Good
3	Drivers of SC in Uganda	0.892	Good
AVERAGE		0.867	Good

3.7 Sources of data

This section explains the means by which data used in the study was obtained.

3.7.1 Primary sources

Primary data refer to the information collected by the researcher first hand specifically for research assignment through various methods like questionnaires, interviews, field observations etc. (Creswell and Creswell, 2018). Primary data were obtained through observations, interviews and questionnaires that were filled by the respondents from the respective professional bodies and selected sites within the study area.

3.7.2 Secondary sources

Secondary data refer to data already published by different researchers and is readily available for other researchers carrying out a similar study. They include books, industry survey compilations from computerized databases, published printed sources, journals, published electronic sources, magazines and newspapers etc. (Creswell and Creswell, 2018). In this investigation, journals, published theses and books were used.

3.8 Data Analysis

The data and responses from observations and interviews were summarized and analyzed to create a list of barriers and drivers in SC for making questionnaires together with data from literature review. The filled questionnaires were collected, checked for accuracy, consistency and completeness before leaving the field. Raw data was then analyzed quantitatively by statistical analysis using Statistical Package for Social Scientists (SPSS) and MS Excel.

3.9 Ethical considerations

Ethical considerations in research refer to the set of principles that guide researchers in conducting studies responsibly and with integrity. These principles ensure that the rights, dignity, and safety of participants are respected throughout the research process. In this study, ethical standards were upheld during data collection. Informed consent was obtained from all participants, ensuring that they willingly agreed to take part in the research after being informed of its purpose and their role. To maintain confidentiality and protect participants' identities, they were not required to include their names or any personally identifiable information on the questionnaires.

3.10 Achievement of Specific objectives

This sub- topic explains how each of the four specific objectives was achieved.

3.10.1 Levels of awareness and interpretation of SC in Uganda

Section B of the questionnaire aimed at investigating the first objective of the study. It had various interpretations or definitions of SC. The respondent was required to express his or her level of agreement with each of the definitions on a likert scale of 1 to 5. Options for “no idea” and “none of the above” were also included for purposes of identifying participants with no awareness of SC. The percentage of responses corresponding to the “no idea” and “none of the above” options gave an indication of the level of awareness of SC of the participants. Interpretation of SC by participants was obtained by calculating the Mean Item Score of each of the definitions or interpretations using the equation by Tholibon et al. (2021);

$$\text{Mean Item Score} = (1n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_5) \div \sum N \text{ ----- (Equation 3.4)}$$

Where;

n_i is the number of respondents for each point, i , on the Likert scale as regards to a particular interpretation, and

N is the total number of respondents.

3.10.2 Barriers to SC in Uganda

First, a comprehensive review of related literature and information gathered from interviews identified the barriers and drivers to SC worldwide. Section C of the questionnaire aimed at investigating the second objective of the study. The respondents were required to use a likert scale and indicate the extent to which they agreed with each of the barriers listed on a five-point likert scale. The five-point likert scale was used due to its ability to give results that are easy to interpret and unambiguous (Zulu et al., 2022).

For purposes of identifying the most critical barriers, the Relative Impact Index (RII) of each barrier was calculated using the equation by Ohiomah et al. (2019);

$$\text{RII} = \sum W_i \div (AN) \text{ ----- (Equation 3.5)}$$

Where,

RII = the relative impact index for item i ;

$\sum W_i$ = the sum of all ratings from all experts for item i ;

A = the highest possible rating permissible in the adopted scale (i.e., 5 in this study); and N = the total number of respondents.

Variables with $RII < 0.599$ were deemed to be insignificant barriers, variables with RII between 0.599 and 0.80 were deemed significant barriers and variables with $RII > 0.80$ were deemed critical barriers. The statistical significance for each of the variables was also calculated. A statistically significant result has a very low chance of occurring if there were no true effect in a research study. In this study, a P-value of 0.05 or less was considered statistically significant.

3.10.3 Drivers to SC in Uganda

First, a comprehensive review of related literature and data from interviews identified the barriers and drivers to SC worldwide. A total of 25 drivers were listed. Section D of the questionnaire aimed at investigating the third objective of the study. The respondents were required to use a likert scale and indicate the extent to which they agreed with each of the drivers listed. The five-point likert scale was used due to its ability to give results that are easy to interpret and unambiguous (Zulu et al., 2022).

For purposes of identifying the most critical drivers, after collecting the data, the RII of each barrier was calculated using the formula by Ohiomah et al. (2019) in section 3.10.2. Variables with $RII < 0.599$ were deemed to be insignificant drivers, variables with RII between 0.599 and 0.80 were deemed significant drivers and variables with $RII > 0.80$ were deemed critical drivers. The statistical significance for each of the variables was also calculated and a P-value of 0.05 or less was considered statistically significant.

3.10.4 Developing framework for promotion of wider adoption of SC in Uganda

The establishment of drivers to SC can lead to its wider adoption. However, this can also be hindered by the presence of a number of barriers. Therefore, the study identified the most critical barriers and drivers to SC in Uganda. Strategies on how to alleviate or minimize the identified critical barriers, whilst encouraging the advancement of the identified critical drivers were then devised to develop a framework aimed at achieving a wider adoption of SC in Uganda.

3.11 Chapter Summary

This chapter highlights the methods that were used to achieve the objectives of the study. It also highlights the study population and methods that were used for sampling. The next chapter presents the findings of the study that was conducted, their analysis and discussion.

CHAPTER FOUR: ANALYSIS, PRESENTATION AND DISCUSSION OF RESULTS

4.1 Introduction

This chapter presents the findings of the research conducted in Uganda, with a specific focus on Wakiso and Kampala. The study examines the barriers and drivers affecting sustainable construction in Uganda. The presentation primarily centers around the study objectives and offers an overview of the demographic information of the participants. Subsequent sections provide in-depth insights into the study's detailed findings.

4.2 Response rate

Results regarding the response rate in this study are presented in Table 4.1.

Table 4.1: Response rate

	Frequency	Percentage
Target respondents	195	100.00
Actual responded	175	89.7
Actual considered	173	88.7

The response rate for this study was 89.7%. However, questionnaires from two respondents (1.02%) who indicated that they had no idea about the concept of SC were not considered leaving 173 out of the targeted 195 respondents actively participating. This high response rate suggests a significant level of engagement and interest among the construction professionals and stakeholders in Uganda. The substantial representation of the population enhances the reliability and validity of the research findings, allowing for

more confident generalizations and conclusions regarding the barriers and drivers of Sustainable Construction in Uganda.

4.3 Bio data of the Respondents

A total of 173 construction professionals fully participated in the study. The demographic factors were considered important to the study; details of the participants, category, gender, profession, level of education, experience and designation are presented in the subsequent section.

4.3.1 Gender of Respondents

According to the respondents' gender, a percentage was calculated, as shown in Table 4.2.

Table 4.2: Demographic Representation of Respondents by Gender

Gender	Frequency	Percentage
Male	153	88.4%
Female	20	11.6%
Total	173	100

Table 4.2 shows that out of the total 173 respondents, the majority were male, accounting for 88.4% (153 individuals), while the female respondents comprised 11.6% (20 individuals). This gender distribution indicates a significant gender disparity, with a higher representation of males in the study sample. The notable gender imbalance within the respondent pool highlights the need for increased efforts to encourage and promote female participation and representation in the construction industry, particularly in the

context of sustainable construction in Uganda. Addressing gender disparities can foster diversity and inclusivity, leading to a more comprehensive understanding of the barriers and drivers of sustainable construction.

4.3.2 Profession

According to the respondents' profession, a percentage was calculated, as shown in table 4.3.

Table 4.3 Representation of the respondents by profession

Profession	Frequency	Percentage
Civil Engineer	88	50.9%
Architect	40	23.1%
Surveyor	25	14.5%
Environmentalist	20	11.6%
Total	173	100

Table 4.3 displays the representation of respondents by profession. The largest professional group among the respondents was civil Engineers, comprising 50.9% (88 individuals) of the sample. Architects accounted for 23.1% (40 individuals), while surveyors and environmentalists represented 14.5% (25 individuals) and 11.6% (20 individuals) respectively. The distribution of respondents across different professions highlights the diverse expertise and perspectives present within the study sample. This varied representation can contribute to a more comprehensive understanding of the barriers and drivers of sustainable construction in Uganda. Collaboration and knowledge-sharing among professionals from different disciplines can facilitate holistic approaches to

sustainable construction practices. This finding suggests that the data used were reliable and could therefore lead to reliable and dependable study findings.

4.3.3 Education Qualification of the Respondents

The study also identified participants' highest levels of education. The resultant distribution is displayed in Table 4.4.

Table 4.4 Representation of the respondents by education qualification

Level of education	Frequency	Percentage
Diploma/College	45	26.0%
Bachelor's Degree	88	50.9%
Post-graduate Diploma	20	11.6%
Master's Degree	20	11.6%
Doctorate	2	1.2%
Total	173	100

Table 4.4 presents the representation of respondents by their level of education qualification. The largest group among the respondents held a Bachelor's Degree, accounting for 50.9% (88 individuals) of the sample. Those with a Diploma/College qualification comprised 26.0% (45 individuals), while individuals with a Post-Graduate Diploma and Master's Degree each represented 11.6% (20 individuals). A small percentage of respondents held a Doctorate, making up 1.2% (2 individuals) of the sample. The distribution of respondents across different levels of education reflects the varying levels of expertise and knowledge within the study sample. The representation of individuals with higher education qualifications, such as Master's and Doctorate degrees, can contribute to a more nuanced understanding of the barriers and drivers of sustainable

construction. Their advanced knowledge and skills can help inform strategies and solutions for promoting sustainable construction practices in Uganda.

4.3.4 Years of experience

The study also identified participant’s years of experience. The resultant distribution is displayed in Table 4.5.

Table 4.5: Representation of respondents by Years of experience

Years of Experience	Frequency	Percentage
Less than 2 years	9	5.2%
2-5 years	50	28.9%
6-9 years	65	37.6%
10 and above	49	28.3%
Total	173	100

Table 4.5 illustrates the representation of respondents based on their years of experience in the construction industry. Among the respondents, 5.2% (9 individuals) had less than 2 years of experience, while 28.9% (50 individuals) had 2-5 years of experience. Respondents with 6-9 years of experience accounted for 37.6% (65 individuals), and those with 10 or more years of experience constituted 28.3% (49 individuals) of the sample. The distribution of respondents across different years of experience indicates a diverse range of expertise within the study sample. The inclusion of individuals with varying levels of experience allows for a comprehensive understanding of the barriers and drivers of sustainable construction in Uganda. The insights and perspectives shared by professionals at different stages of their careers can contribute to identifying practical strategies and solutions that address the specific challenges faced by individuals at different points in

their professional journey. Leveraging the collective knowledge and experience of professionals across various experience levels can enhance the effectiveness and applicability of initiatives aimed at promoting sustainable construction practices in Uganda.

4. 4 Level of awareness and interpretation of sustainable construction

The third objective aimed to establish the level of awareness and interpretation of SC in Uganda. Results regarding this were presented in the table 4.8.

Table 4.6: Level of awareness and interpretation of sustainable construction

Definitions of SC	Mean	SD	Ranking	%age (Respondents)
Environmental Sustainability				
Construction practices that enhance environmental protection such as avoiding construction in wetlands and reducing greenhouse emissions.	4.23	0.81	1	98.86
Construction practices that minimize over usage of natural resources such as water, sand, stones.	4.19	0.82	2	98.86
Economic Sustainability				

Construction practices that generate profits without compromising people's future needs.	4.02	0.94	3	98.86
Construction practices that ensure minimal lifetime maintenance costs of the building	3.98	1.02	4	98.86
Social Sustainability				
Construction practices that promote quality of life and human satisfaction such as promoting safety at workplace	3.83	1.02	6	98.86
Construction practices that practice corporate social responsibility	3.85	1.13	5	98.86
No idea				1.14
None of the above				0

Out of the 175 questionnaires that were returned, only two of the participants representing 1.14% indicated that they had no idea about the concept of SC. This implied a 98.86% awareness of the concept of SC amongst the participants, thus a high level of awareness. This finding is in line with a study carried out in Uganda by Kibwami and Tutesingesi, (2016), which reported that 100% of the participants in that study had an idea about the concept of SC, though in varying levels. In a study carried out in Kuwait, 100% of the respondents had awareness about the concept of SC (Alsanad, 2015). In Ghana, 83% level of awareness was reported by Ametepey et al. (2015).

A statement that describes sustainable construction as “construction practices that enhance environmental protection such as avoiding construction in wetlands and reducing greenhouse emissions” received the highest mean score of 4.23. This suggests that respondents highly interpret SC to mean environmentally-friendly construction practices and their role in mitigating environmental impacts. The implication is that there is a foundation for promoting sustainable construction practices in Uganda, particularly in terms of environmental protection.

Similarly, construction practices that minimize the over-usage of natural resources, such as water, sand, and stones, also received a high mean score of 4.19. This also indicates that a large number of respondents highly interpreted SC to mean conservation of natural resources in regards to construction activities. The implication is that there is a potential for implementing resource-efficient practices and reducing the environmental footprint of construction projects.

Construction practices that generate profits without compromising peoples’ future needs received a mean score of 4.03. While this score suggests a high level of interpretation in that direction amongst respondents. The implication is that there is a need to further educate and communicate the economic advantages of sustainable construction practices, such as reduced maintenance costs and enhanced market value.

Similarly, construction practices that ensure minimal lifetime maintenance costs of the building received a mean item score of 3.98. This suggests that respondents recognize the importance of considering lifecycle costs in construction decision-making. The

implication is that there is an opportunity to promote life-cycle thinking and highlight the economic benefits of sustainable construction in terms of long-term cost savings.

Construction practices that promote quality of life and human satisfaction, such as promoting safety at the workplace, received a mean item score of 3.83. This reflects a strong awareness of the importance of creating safe and healthy environments in construction projects. The implication is that there is a foundation for integrating health and safety practices into sustainable construction initiatives, thereby enhancing the well-being of construction workers and occupants.

On the other hand, construction practices that practice corporate social responsibility received the lowest mean score of 3.85. This suggests that there is a need to enhance understanding and awareness of the social aspects of sustainable construction, including community engagement, social equity, and ethical considerations. The implication is that there is an opportunity to foster a broader understanding of corporate social responsibility within the construction industry and promote sustainable practices that benefit society.

Generally, the statements that described sustainable construction in line with environmental sustainability had the highest mean score. These were followed by statements that described sustainable construction in line with economic sustainability, and lastly, social sustainability.

The results thus suggest that construction professionals in Uganda widely interpreted sustainable construction as synonymous with environmental sustainability. This finding is similar to the one reported by Kibwami and Tutesingensi, (2016) in their study carried

out in Uganda, wherein 86% of the respondents interpreted sustainable construction as synonymous with environmental sustainability. This was followed by economic sustainability and lastly, social sustainability.

Also, a study carried out in South Africa by Ohioma et al. (2021) amongst construction professionals reported similar results whereby the definitions that related sustainable construction to environmental sustainability received the highest mean item scores as compared to other definitions. This was also in line with findings by Anzangira et al. (2021) in their study carried out in Sub-Saharan African countries and Zulu et al. (2022) in their study carried out in Zambia.

Meanwhile, the fact that statements that relate sustainable construction to social sustainability received the lowest mean scores is also not very surprising. For instance, in a study carried out in China by Shen et al. (2010), it was reported that during feasibility assessments of projects, social performance attributes are usually not considered.

Overall, these findings offer two suggestions. Firstly, that the interpretation of sustainable construction amongst construction professionals in Uganda is not so different from other countries.

Secondly, that there is a relatively high level of awareness of sustainable construction amongst construction professionals in Uganda. However, a high level of awareness does not directly translate into a high level of sustainable construction practices (Abidin, 2010). It however indicates that initiatives aimed at promoting sustainable construction can be easily appreciated.

4.5 Barriers to sustainable construction in Uganda

The study set one of its objectives to determining the barriers to Sustainable Construction in Uganda. Relative Importance Index was associated with the predictors. The details are shown by the values of the respective relative importance indexes (RII) on this objective, together with the statistical significance. A p-value of 0.05 or less was considered statistically significant. Results are shown in Table 4.6 and preceding analysis in the following descriptions.

Table 4.7: Barriers to Sustainable Construction in Uganda

Barriers	RII	SS(p-value)	Rank by Category	Overall Ranking
Government/institutional barriers				
Lack of strategy for promotion of Sustainable Construction	0.88	0.013	1	2
Lack of or insufficient government support	0.86	0.012	2	3
Conflicting government priorities	0.81	0.035	3	5
Weak enforcement of laws and regulations	0.79	0.042	4	7
Inefficient building codes and regulations	0.75	0.038	5	13
Lack of incentives from government	0.74	0.040	6	15
Legal prohibitions and bans on sustainable materials	0.68	0.120	7	21
Cumbersome procedures to obtain approvals	0.62	0.035	8	25
Average	0.76	0.042		

Economic barriers				
Higher investment cost in terms of materials, special storage, equipment, operation, and long construction periods	0.81	0.022	1	5
Long payback period	0.79	0.012	2	7
Lack of financing schemes from financial institutions that support sustainable construction rather than the traditional	0.76	0.035	3	11
Cost estimates inaccuracy/uncertainty	0.73	0.042	4	17
Limited local suppliers of sustainable building material, thus the need for importation of materials and technologies from suppliers in foreign markets	0.71	0.032	5	19
Average	0.76	0.029		
Social/Cultural barriers				
Limited demand from the market including companies and society	0.90	0.013	1	1
Limited public awareness coupled with limited knowledge and information about Sustainable Construction	0.86	0.012	2	3
Change resistance from conventional to sustainable buildings	0.79	0.025	3	7
Limited knowledge of benefits from Sustainable Construction	0.76	0.042	4	11

Sustainable construction practices are time-consuming	0.67	0.012	5	24
Average	0.66	0.021		
Professional barriers				
Limited professional knowledge and expertise	0.79	0.022	1	7
Uncertainty of long-term performance	0.75	0.012	2	13
Lack of training and education	0.74	0.035	3	15
Lack of and limited knowledge of technologies	0.72	0.042	4	18
International SC design standards not being adapted to fit local needs	0.71	0.028	5	19
Lack of common understanding and interpretation of SC amongst the various stakeholders of construction projects	0.68	0.040	6	21
Increased documentation	0.68	0.120	6	21
Lack of sustainable projects as demonstrations	0.62	0.034	8	25
Average RII	0.71	0.028		
OVERALL AVERAGE	0.74	0.030		
KEY: RII < 0.5999 – Insignificant barrier; 0.5999 < RII < 0.80 – Significant barrier; RII > 0.80 – Critical barrier				
p-value > 0.05 – Statistically significant				

(i) Government/Institutional Barriers:

Lack of strategy for promotion of Sustainable Construction with a high RII of 0.88, ranked 1st amongst government barriers and 2nd overall. This indicates that the lack of a comprehensive strategy for promoting sustainable construction is a critical barrier. This finding is in line with studies done by Daniel et al. (2018), respectively who submitted that lack of strategy to promote SC ranked amongst the high-level barriers to SC in Nigeria. Osuizugbo et al. (2020) in his studies carried out in Nigeria however reported this barrier as a moderate barrier. Developing a national strategy that outlines goals, targets, and action plans for sustainable construction is imperative. This strategy should involve collaboration between government agencies, industry stakeholders, and educational institutions to drive the adoption of sustainable construction practices. Implementation mechanisms, including monitoring and evaluation frameworks, should be established to ensure effective implementation and progress tracking.

Lack of or insufficient government support with a high RII of 0.86, ranked 2nd amongst government barriers and 3rd overall, thus showing that the lack of government support is a critical barrier to sustainable construction in Uganda. This is in line with the findings by Osuizugbo et al. (2020) and Aghimien et al. (2018) in their studies carried out in Nigeria. According to Powmya and Abidin (2014), governments play a key role in the enforcement of regulations, revision of existing legislation and policies, the introduction of building codes, incentives and other fiscal instruments to spearhead SC adoption. If governments fail in this capacity, it poses a grave danger to the implementation of SC practices. This implies that increased government involvement and support are essential to promote

sustainable construction practices. The government should develop and implement policies that incentivize sustainable construction, allocate resources for research and development, and provide financial support for sustainable projects. Additionally, raising awareness among policy makers about the benefits of sustainable construction can lead to policy reforms that facilitate its wider adoption.

Conflicting government priorities with RII of 0.81 ranked 3rd amongst government barriers and 5th overall, thus indicating that conflicting government priorities is a critical barrier to sustainable construction. This was similarly reported by Durdyev et al. (2018) in his studies carried out in Cambodia, Fathalizadeh et al. (2022) in his research carried out in Iran and Zulu et al. (2020) in his study carried out in Zambia. Aligning government priorities with sustainable development goals and integrating sustainable construction practices into national development plans can help overcome this barrier. Promoting interdisciplinary collaboration among government departments and engaging in stakeholder consultations can lead to the integration of sustainable construction as a priority in government agendas.

Weak enforcement of laws and regulations with a RII of 0.79 ranked 4th amongst government barriers and 7th overall, an indication that weak enforcements of laws and regulations is identified as significant barrier. This is in line with submissions of a study by Dosumu and Aigbavboa (2021) and Daniel et al. (2018) in their studies carried out in South Africa and Nigeria respectively. However, this is in contrast with the findings by Osuizugbo et al. (2020) in their studies carried out in Nigeria where weak enforcement of

regulations was reported as a low-level barrier. Strengthening enforcement mechanisms and ensuring compliance with sustainable construction requirements are crucial. Implementing monitoring and evaluation systems, establishing penalties for non-compliance, and providing training and capacity-building programs for enforcement agencies can improve the enforcement of sustainable construction regulations.

(i) Economic Barriers:

Higher investment cost in terms of materials, special storage, equipment, operation, and long construction periods with a RII of 0.81 ranked 1st amongst economic barriers and 5th overall. Thus, higher investment costs are identified as a critical barrier. This is in line with the submission by Ifije and Aigbavboa (2020). Ametepey et al. (2015) asserts that the fear of higher investment costs is a crucial barrier to the adoption of SC practices in most developing countries in the world. This is however in contrast with findings by Daniel et al. (2018) and Osuizugbo et al. (2020) in their studies carried out in Nigeria. Uganda being a developing country, developers are conservative with the little finances they have. Thus, the fear of SC inflicting a higher cost to them than the conventional methods become a barrier to its adoption. However, Aigbavboa et al. (2017) argued that the idea of SC having a higher investment cost is more of an assumption made without thoroughly analyzing the overall life-cycle cost of projects. This assumption was described as a “lazy view” of construction participants. The implication is that efforts should be made to explore cost-effective alternatives and innovative financing mechanisms that reduce the financial burden associated with sustainable construction. This can include promoting the use of locally sourced and renewable materials,

encouraging the development of sustainable technologies, and establishing financial schemes specifically designed to support sustainable construction projects. Additionally, providing financial incentives and tax benefits to developers and investors can help offset the higher initial costs and incentivize the adoption of sustainable construction practices.

Long payback period with a RII of 0.79 ranked 2nd amongst economic barriers and 7th overall indicating the long payback period is identified as a significant barrier. This was revealed by similar studies done by Durdyev et al (2018) in Cambodia, Ametepey et al. (2015) in Ghana and Mpavaenda (2018) in Botswana. This is however in contrast to the findings of a study in Nigeria by Osuizugbo (2020) which reported long payback period as low-level barrier. To address this, stakeholders should consider adopting innovative financial models, such as green bonds and energy performance contracting, which provide mechanisms for cost recovery over a longer time frame. Additionally, providing financial incentives, subsidies, and tax breaks to projects with shorter payback periods can help accelerate the adoption of sustainable construction practices. Public awareness campaigns emphasizing the long-term cost savings and return on investment associated with sustainable construction can also help overcome resistance to longer payback periods.

(ii) Social/Cultural Barriers:

Limited demand from the market including companies and society with a RII of 0.90 ranked 1st amongst social barriers and 1st overall. Thus, limited market demand poses a critical barrier. This finding is similar to studies by Fathalizadeh et al. (2022) in Iran, Ametepey et al. (2015) in Ghana, Osuizugbo et al. (2020) in Nigeria and Durdyev et al.

(2018) in Cambodia. Client demand has a significant influence on encouraging practitioners to implement SC practices on their projects. Creating market demand for sustainable construction requires a multifaceted approach. Promoting the value proposition of sustainable buildings in terms of energy efficiency, reduced operational costs, and improved occupant health and comfort is essential. Encouraging public and private entities to adopt green building standards, offering incentives for sustainable projects, and showcasing successful sustainable construction projects can help generate market demand. Engaging with industry associations, developers, and real estate professionals to educate and promote the benefits of sustainable construction can also drive market transformation.

Limited public awareness coupled with limited knowledge and information about sustainable construction with a RII of 0.86 ranked 2nd amongst social barriers and 3rd overall, indicating that limited public awareness is identified as a critical barrier. Alsanad (2015) in his study carried out in Kuwait reported that lack of public awareness is the greatest barrier to SC in that country. This also resonates with other studies carried out by Ifije and Aigbavboa (2020), Fathalizadeh et al. (2021), Daniel et al. (2020), Davies and Davies (2017). Raising public awareness about the importance and benefits of sustainable construction is crucial. Education campaigns, workshops, and community engagement initiatives can help increase public knowledge and understanding. Providing easily accessible information through various media channels, including websites, brochures, and social media platforms, can empower individuals to make informed choices and demand sustainable construction practices. Building partnerships with educational

institutions, professional organizations, and community groups can further enhance public awareness and knowledge dissemination.

Change resistance from conventional to sustainable buildings with a RII of 0.79 ranked 3rd amongst social barriers and 7th overall, thus change resistance represents a significant barrier. This finding is similar to findings of the study carried out in Kuwait by Alsanad (2015), and in Zambia by Aghimien et al. (2015), Zulu et al. (2022) and Fathalizadeh et al. (2022). However, Osuizugbo et al. (2020) reports that change resistance is a moderate level barrier in Nigeria. This change resistance results in a lack of demand for sustainable products by clients and stakeholders. Overcoming this resistance requires targeted strategies that highlight the advantages of sustainable buildings. Demonstrating the long-term cost savings, improved environmental performance, and enhanced occupant well-being associated with sustainable construction can help alleviate skepticism and resistance. Sharing case studies, providing technical assistance, and facilitating knowledge-sharing platforms can support the industry in transitioning from conventional to sustainable building practices.

(iii) Professional Barriers:

Limited professional knowledge and expertise with a RII of 0.79 ranked 1st amongst professional barriers and 7th overall. Thus, limited professional knowledge and expertise is recognized as a significant barrier. This is in line with studies by Daniel et al. (2018), Dosumu and Aigbavboa (2021), Ametepey et al. (2015), and Nikyema and Blouin (2020) in their studies carried out in Nigeria, Ghana and Burkina Faso respectively. Addressing

this barrier requires comprehensive training programs and capacity-building initiatives to enhance the skills and competencies of professionals in sustainable construction practices. Collaboration with educational institutions, professional associations, and industry experts can facilitate the development and delivery of specialized training courses, certifications, and professional development programs. Promoting continuous learning and knowledge-sharing platforms within the industry can further support the dissemination of best practices and the advancement of professional expertise.

Uncertainty of long-term performance with a RII of 0.75 ranked 2nd amongst professional barriers and 13th overall. The uncertainty surrounding the long-term performance of sustainable construction is identified as a significant barrier. This was similarly reported by findings of a study carried out in the United States, Sweden and New Zealand by Dalirazar and Sabzi (2020). Similarly, in a study carried out in Ghana by Chan et al. (2018), it was reported that uncertainties involved in the adoption of new technologies is a barrier to the adoption of SC. Addressing this requires establishing industry standards, certifications, and performance evaluation systems that provide assurance of long-term sustainability and performance. Conducting life cycle assessments, monitoring the performance of sustainable buildings over time, and disseminating data on their environmental and energy performance can help alleviate concerns and build confidence in sustainable construction practices.

Lack of training and education with a RII of 0.74 ranked 3rd amongst professional barriers and 15th overall. The lack of training and education is recognized as a significant barrier.

This was similarly reported by studies carried out in Nigeria by Osuizugubo et al. (2020), Davies and Davies (2017), in Zambia by Zulu et al. (2022) and in South Africa by Marsh et al. (2020). To address this, comprehensive training programs and educational initiatives should be developed and implemented at various levels, including vocational training, higher education, and continuous professional development. Integrating sustainability principles and practices into construction-related curricula, offering specialized courses on sustainable construction, and providing accessible training opportunities can equip professionals with the necessary knowledge and skills to adopt and implement sustainable construction practices.

4.6 Drivers to sustainable construction in Uganda

The study set one of its objectives to explore the drivers to Sustainable Construction in Uganda. Relative Importance Index was associated with the predictors/drivers. The details are shown by the values of the respective relative importance indexes (RII) on this objective, together with the statistical significance. Results are shown in Table 4.8 and subsequently analyzed in the following descriptions.

Table 4.8: Drivers to Sustainable Construction in Uganda

Drivers	RII	SS (p-value)	Rank by Category	Overall Ranking
Environmental drivers				
Reduction in the use of natural resources during construction including water, materials, energy, etc.	0.84	0.022	1	1

Providing Sustainable Construction measurement and voluntary rating/certification	0.83	0.012	2	2
Improving indoor environmental quality	0.82	0.035	3	5
Use of renewable resources as opposed to non-renewables resources	0.81	0.042	4	7
Greater availability and affordability of Sustainable Construction materials	0.79	0.032	5	12
Enforcement of compliance with environmental regulation	0.78	0.040	6	13
Improving water efficiency of buildings	0.78	0.020	6	13
Greater recycling of products	0.76	0.035	8	19
Minimize pollutants that cause environmental degradation	0.76	0.032	8	19
Development of comprehensive databases	0.75	0.020	10	22
Waste reduction	0.73	0.045	11	25
Average	0.79	0.030		

Economic drivers

High return on investment	0.83	0.023	1	2
Utilizing local resources including labor and materials during construction	0.82	0.032	2	5
Financial affordability by society	0.81	0.012	3	7
Enhancing market value and marketability of buildings	0.78	0.035	4	13
Providing incentives to those applying sustainability measures	0.77	0.042	5	17
Choosing environmentally compliant responsible suppliers/contractors	0.76	0.032	6	19

(i) Environmental Drivers:

Reduction in the use of natural resources during construction including water, materials, energy, etc. with an RII of 0.84 ranked 1st amongst environmental drivers and 1st overall. The reduction in the use of natural resources is identified as a critical driver. This finding is similar to the findings reported by a study carried out in Uganda and Botswana by Kibwami and Tutesigensi (2016) and Mpvaenda et al. (2018) respectively. This indicates that stakeholders in Uganda recognize the importance of conserving resources and minimizing their environmental impact. Emphasizing sustainable practices such as efficient resource management, waste reduction, and responsible sourcing can lead to significant environmental benefits. Implementing strategies such as using recycled materials, optimizing water and energy efficiency, and adopting renewable resources can contribute to sustainable construction practices and conservation efforts.

Providing sustainable construction measurement and voluntary rating/certification with a RII of 0.83 ranked 2nd amongst environmental barriers and 2nd overall. Providing sustainable construction measurement and voluntary rating/certification is identified as a critical driver. Kibwami and Tutesigensi (2016) in their study carried out in Uganda reported that the establishment of rating schemes can drive the population towards SC practices. This was further re-echoed by Mpavaenda (2018) in his study carried out in Botswana and Dosumu and Aigbavboa (2021) in South Africa. Mpavaenda (2018) asserts that the provision of green building rating systems is a driver towards SC. Establishing measurement systems, rating tools, and certification programs can help assess and benchmark the sustainability performance of construction projects. Voluntary

certifications such as green building certifications and sustainability labels can incentivize stakeholders to adopt sustainable practices. Collaborating with industry experts, government agencies, and certification bodies can promote the implementation of sustainable construction measurement and certification frameworks.

Improving indoor environmental quality with a RII of 0.82 ranked 3rd amongst environmental barriers and 5th overall. Improving indoor environmental quality is recognized as a critical driver. Zulu et al. (2022), in his study carried out in Zambia reported similar findings. Creating healthy and comfortable indoor environments contributes to the well-being and productivity of building occupants. Implementing strategies such as proper ventilation, natural lighting, and the use of non-toxic materials can improve indoor air quality and promote occupant health. Providing guidelines and standards for indoor environmental quality, conducting awareness campaigns, and incorporating sustainable design principles can enhance the adoption of practices that prioritize indoor comfort and health.

Use of renewable resources as opposed to non-renewables resources with a RII of 0.81 ranked 4th amongst environmental barriers and 7th overall. The use of renewable resources is considered a critical driver. Kibwami and Tutesigensi (2016) and Oguntona (2019), in their studies carried out in Uganda and South Africa respectively reported similar findings. Shifting from non-renewable to renewable resources reduces dependence on fossil fuels and promotes a more sustainable energy mix. Emphasizing the use of renewable energy sources such as solar, wind, and biomass in construction projects can contribute to energy

efficiency and carbon footprint reduction. Providing incentives, promoting renewable energy technologies, and integrating renewable energy requirements into building codes and regulations can accelerate the adoption of sustainable energy practices in Uganda's construction industry.

Greater availability and affordability of Sustainable Construction materials with a RII of 0.79 ranked 5th amongst environmental barriers and 12th overall. The availability and affordability of sustainable construction materials is identified as a significant driver. Similar studies in Cambodia by Durdyev et al. (2018) ranked availability of SC materials as a moderate level barrier. This was closely related to another study in South Africa by Marsh et al. (2020). Ensuring a wide range of sustainable construction materials that are locally sourced or readily available can facilitate their adoption. Promoting sustainable material alternatives, supporting local production, and incentivizing the use of environmentally friendly materials can enhance their accessibility and affordability. Collaboration between material suppliers, researchers, and the construction industry can contribute to expanding the availability of sustainable construction materials in Uganda.

(i) Economic drivers

High return on investment with a RII of 0.83 ranked 1st amongst economic drivers and 2nd overall. The expectation of a high return on investment is identified as a critical driver. Zulu et al. (2022) reported high return on investment as a high-level driver to SC. Durdyev et al. (2018) and Oguntona et al. (2019) reported it as a moderate level driver. Sustainable construction practices can offer long-term financial benefits by reducing operational costs,

increasing energy efficiency, and improving occupant satisfaction. Emphasizing the economic advantages of sustainable buildings, such as energy savings, lower maintenance costs, and potential tax incentives, can attract investors and developers. Collaboration between financial institutions, sustainability experts, and the construction industry can promote financial mechanisms and investment strategies that prioritize sustainable construction projects with a high return on investment.

Utilizing local resources including labor and materials during construction with a RII of 0.82 ranked 2nd amongst economic drivers and 5th overall. The utilization of local resources, including labor and materials, is identified as a critical driver. This was similarly reported by Kibwami and Tutesingesi (2016) in their study carried out in Uganda. Maximizing the use of local resources not only supports local industries and economies but also reduces transportation-related carbon emissions and promotes sustainability. Prioritizing local sourcing of materials, engaging local labor, and promoting local industries can enhance the economic impact of sustainable construction. Collaboration between the construction industry, local communities, and government entities is crucial to develop policies and initiatives that facilitate the utilization of local resources.

Financial affordability by society with a RII of 0.81 ranked 3rd amongst economic drivers and 7th overall. Financial affordability by society is recognized as a critical driver. Affordability plays a crucial role in the adoption of sustainable construction practices. Oguntona et al. (2019) in his study carried out in South Africa ranked financial

affordability of SC materials amongst the top 4 drivers towards SC. Making sustainable construction financially accessible to a broader segment of society can encourage its widespread implementation. Providing financial incentives, subsidies, or grants, as well as exploring innovative financing mechanisms, can help bridge the affordability gap. Collaboration between financial institutions, government agencies, and the construction industry is vital to develop financing options that support sustainable construction initiatives.

Enhancing market value and marketability of buildings with a RII of 0.78 ranked 4th amongst economic drivers and 13th overall. Enhancing the market value and marketability of buildings is considered a significant driver. Zulu et al. (2022) and Durdyev et al. (2018) in their study carried out in Zambia and Cambodia respectively reported similar findings. Sustainable buildings often command a higher market value due to their energy efficiency, environmental performance, and lower operational costs. Promoting the benefits of sustainable buildings to property developers, investors, and buyers can create a market demand for such buildings. Providing information on return on investment, life cycle cost analysis, and showcasing successful sustainable building projects can increase the marketability of sustainable construction. Collaboration between developers, real estate agencies, and marketing experts can contribute to raising awareness and creating a market niche for sustainable buildings.

(ii) Social drivers

Increased demand for environmentally friendly buildings with a RII of 0.83 ranked 1st amongst social drivers and 2nd overall. The increased demand for environmentally friendly buildings is recognized as a critical driver. Similar studies in Zambia by Oke et al. (2018), and Zulu et al. (2022) are in agreement with this finding. Growing awareness of environmental issues and the desire for more sustainable lifestyles drive the demand for green buildings. Promoting the benefits of green buildings, such as energy efficiency, reduced environmental impact, and improved occupant comfort, can encourage developers and investors to prioritize sustainable construction practices. Aligning market demand with sustainable construction solutions can foster a shift towards environmentally conscious buildings and support the green building industry in Uganda.

Operations of a sustainable building being compatible with local needs with a RII of 0.81 ranks 2nd amongst social drivers and 7th overall. Ensuring that sustainable buildings meet the local needs and context is identified as a critical driver. Considering cultural, social, and economic factors in the design and operation of sustainable buildings can enhance their functionality and relevance to the local community. Engaging with local stakeholders, conducting needs assessments, and involving end-users in the design process can foster a sense of ownership and promote sustainable building practices that align with local requirements. Collaboration between architects, community representatives, and developers can ensure that sustainable buildings serve as assets that meet the specific needs of Ugandan society.

Increased health and safety at the workplace with a RII of 0.80 ranked 3rd amongst social drivers, and 10th overall. The focus on increased health and safety at the workplace is considered a significant driver. These findings are similar to studies carried out in Kazakhstan by Tokbolat et al. (2019) and in Cambodia by Durdyev et al. (2018). Prioritizing the well-being of construction workers through proper safety measures, training programs, and adherence to occupational health standards can improve working conditions. Ensuring safe working environments, providing protective equipment, and promoting health awareness campaigns can reduce workplace accidents and occupational health risks. Collaboration between construction stakeholders, labor organizations, and regulatory bodies is essential to create a culture of safety and promote the health and well-being of construction workers.

Improving government support through policies and regulations directed towards enhancing Sustainable Construction with a RII of 0.80 ranked joint 3rd amongst social drivers and 10th overall. The improvement of government support through policies and regulations is considered a significant driver. Dosumu and Aigbavboa (2021) in their study carried out in South Africa reported similar findings. Similarly, Zulu et al. (2022) in their study carried out in Zambia. Governments play a critical role in promoting sustainable construction through the development and implementation of supportive policies, regulations, and incentives. Establishing sustainable construction guidelines, providing financial incentives, and incorporating sustainability criteria into public procurement processes can encourage the adoption of sustainable practices. Collaboration between government bodies, industry associations, and sustainability experts can facilitate

the formulation and implementation of effective policies and regulations that drive the sustainability agenda in the construction sector.

4.7 A framework to promote wider adoption of Sustainable Construction in Uganda.

4.7.1 Introduction

The fourth objective was to develop a framework to promote wider adoption of sustainable construction in Uganda. The results of the questionnaire provide valuable insights into the factors influencing the adoption of SC in Uganda. Firstly, the majority of respondents (98.86%) reported being familiar with the concept of SC. This indicates a promising foundation for promoting its adoption, as there is already a level of awareness and understanding among the target population. Building upon this existing familiarity can be an effective strategy in driving further adoption.

The study also shed light on the major barriers to the adoption of Sustainable SC in Uganda, and six (6) barriers were identified as critical barriers. Limited demand from the market emerged as the top barrier, thus a significant challenge. This was followed by lack of strategy to promote SC, limited public awareness, lack of sufficient support from government, conflicting government priorities and higher investment costs as compared to conventional construction. This finding emphasizes the need for a proactive approach by a number of stakeholders at different levels, aimed at eliminating or minimizing the identified barriers.

A number of drivers to SC in Uganda were also identified by the study. Of these, the study revealed that nine (9) drivers were critical. These include; the reduction in the use of

natural resources as the most significant driver, providing SC measurement and voluntary rating tool, high return on investment, increased demand for environmentally friendly buildings, utilizing local resources, improving indoor environmental quality, utilizing local resources including labor and materials during construction, financial affordability by society, use of renewable resources as opposed to non-renewable resources and operations of a sustainable building being compatible with local needs.

These critical barriers and drivers were used as the basis for developing a framework for promotion of wider adoption of SC in Uganda. The framework in figure 4.1 aims to arrange the “organizational environment” in which construction activities are carried out, re-define the roles of those involved in these projects, and enhance their capacities to enable them achieve the common objectives of raising the efficiency of construction projects from three aspects of economy, environment, and function.

4.7.2 Operationalization of the framework

The operationalization of this framework shall be undertaken at three levels of implementation namely; National level, institutional level and the executive level. Various efforts aimed at eliminating or minimizing the identified critical barriers whilst achieving the critical drivers identified in the study, shall be made at each of the three levels, with a general goal of ensuring a wider adoption of SC in Uganda. Each of the three levels will work together in a coordinated manner to ensure alleviation or promotion of the critical barriers and drivers.

Table 4.9: Framework Alignment Table - Critical Drivers and Barriers of SC in Uganda

Driver/Barrier	Framework Component	How the Framework Responds or Leverages It
Reduction in use of natural resources	National, institutional and executive level	Framework promotes resource-efficient materials, restrictions, and research into alternative materials etc.
SC measurement and voluntary rating tools	National level	Encourages adoption or development of local or regional SC rating systems etc.
High return on investment (ROI)	National level	Framework includes provision of tax incentives, tax holidays etc.
Increased demand for environmentally friendly buildings	National, institutional and executive level	Direct influence to developers, public campaigns and seminars, initiate market movement etc.
Utilizing local resources	National, institutional and executive level	Exerting restrictions, education and CPDs, employing local labour etc.
Improved indoor environmental quality	Institutional level	Adequate training and design etc,
Financial affordability by society	National and institutional level	Green financing schemes, subsidies, research etc
Use of renewable over non-renewable resources	National, institutional and executive level	Impose restrictions, exert direct pressure, adequate research etc
SC operations compatible with local needs	Institutional level	Adequate research and training etc.

Limited demand from the market	National, institutional and executive level	Ensure adherence to legal guidelines, exert direct influence, activate market movement etc.
Lack of a strategy to promote SC	National and institutional level	Establish legal guidelines, develop effective strategies etc
Limited public awareness	National and institutional level	Conduct seminars, align academic curriculum etc.
Lack of sufficient support from government	National level	Provide incentives, policies, quick approvals etc.
Conflicting government priorities	National level	Aligned recruitment at various government institutions etc.
Higher investment costs	National, institutional and executive level	Tax incentives, SC development fund, manufacture cheaper materials etc

The above table summarizes how the developed framework aligns with the identified critical barriers and drivers by illustrating the direct linkages between specific framework components and the key issues revealed in the study. Each element of the framework was designed to address the most pressing barriers, such as limited market demand, inadequate public awareness, lack of government support, and high initial costs. Simultaneously, the framework leverages and enhances the critical drivers, including the reduction in the use of natural resources, increased demand for environmentally friendly buildings, and the use of local materials and labor. By doing so, the framework ensures a strategic and evidence-based approach to promote SC adoption in Uganda, with tailored solutions that correspond to the empirical findings of the research.

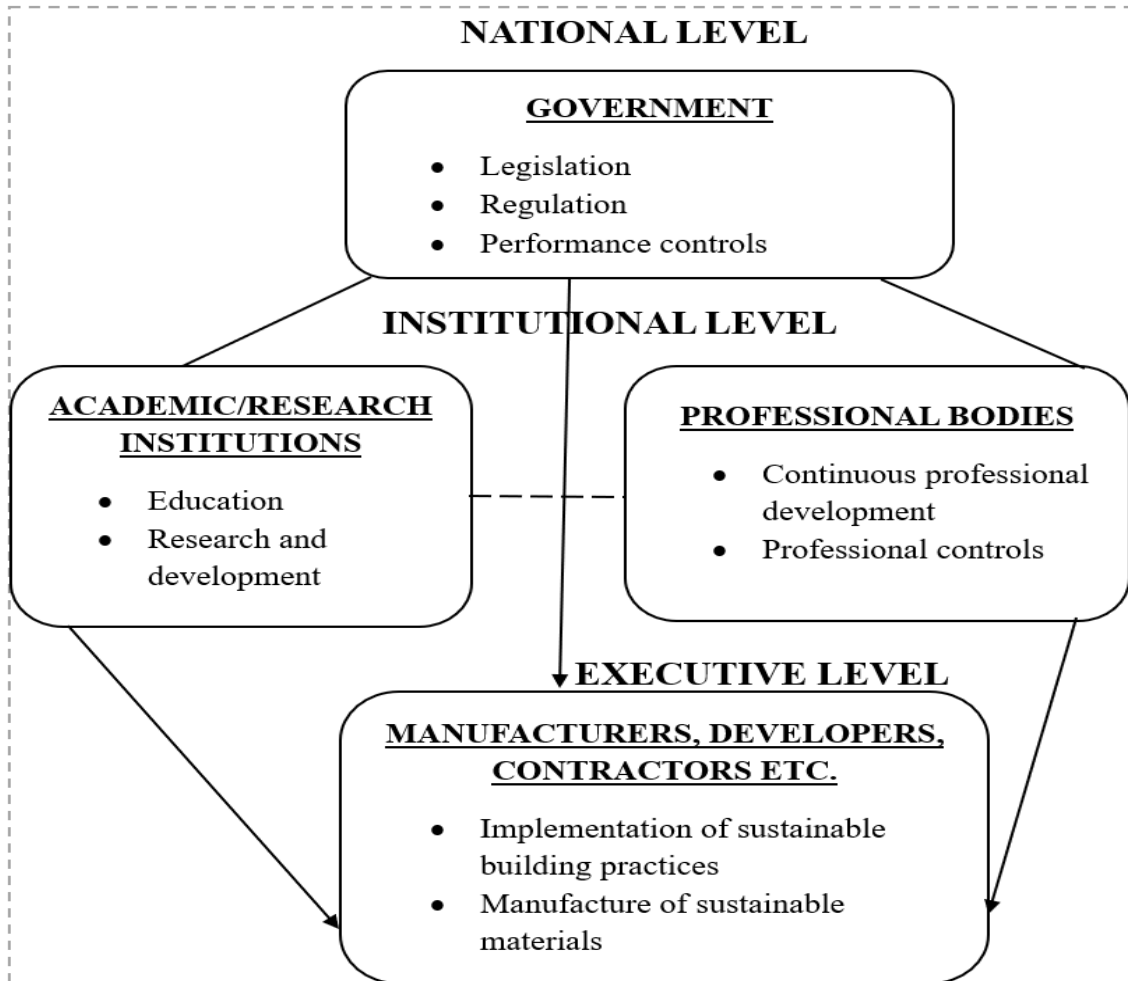


Fig 4.1: Framework to promote the adoption of SC in Uganda

As shown in Figure 4.1, government and its institutions should fulfill their roles through regulatory, normative, and cognitive aspects. The regulatory aspect should focus on enforcing rules, legal pressures, and coercive penalties from official bodies. The normative aspect includes the development of standards and ethics of professionals and educational curricula adopted by professional bodies and academic institutions.

Implementing sustainable building practices at the executive level effectively requires a collaborative effort, where government and institutions play their roles of legislation, education, research and development, professional controls, performance controls etc. in driving change at all levels. The inevitable result is the increase in awareness and interest of those involved in construction projects at the executive level to implement sustainable building practices in their professional practice.

4.7.2.1 National level

Figure 4.1 shows that the solution starts at the national level, where the government with its various institutions of governance (parliament, police, local administrative units, government corporations, ministries, etc.) need to play a very important role in ensuring the achievement of the identified critical drivers to SC whilst alleviating the barriers so as to enable its wider adoption in the country. The government plays its highest levels as a leading role in realizing the concept of sustainable construction practice. This is through development of a mechanism to implement Sustainable building practices. The national mechanism should aim to alleviate or minimize the following critical barriers;

- **Lack of a strategy for promotion of SC**

Government should develop the necessary legal framework and infrastructure to achieve SC. The legal framework should focus on ensuring that SC techniques become mandatory for all construction projects undertaken in the country, and also spell out a clear strategy for promotion of SC.

- **Limited demand from the market**

Government should also ensure compliance to the established legal framework by all stakeholders and developers by assessing the level of sustainability of all proposed construction projects before issuance of construction permits by the various authorities of government, issuance of fines and penalties to violators of SC practices on projects etc. This will exert pressure on individuals, companies and private developers to practice SC techniques and thus increased demand. Further still, government should take lead in implementing sustainable projects by ensuring that all government developments follow sustainable practices. This will encourage other developers to follow suit and thus increase demand.

- **Lack of sufficient government support**

Government through its various agencies should provide adequate support in various areas aimed at promoting the adoption of SC. The support can include incentives to developers undertaking SC, favorable policies and legal frameworks, subsidies, faster approval processes for proposed sustainable projects etc.

- **Conflicting government priorities**

Government should also undertake a deliberate effort to prioritize SC amidst the many conflicting priorities. This can be through recruitment of trained and competent officers at various levels in the engineering departments of government agencies and local governments to solely be responsible for planning, budgeting, developing policies and

ensuring implementation of the established legal framework. These officers will ensure that government remains focused on the promotion of SC amidst other priorities.

- **Higher investment cost in terms of materials, equipment etc.**

Give tax and financial incentives to material suppliers, developers and contractors undertaking sustainable projects. Furthermore, government should set up a SC development fund to enable developers and contractors involved in SC easily access funds for sustainable projects to enhance financial affordability. This will in a long run lower the cost of investment.

- **Limited public awareness**

Promote awareness of the benefits and thus increase demand for SC through workshops, seminars, exhibitions, conferences etc.

The national mechanism should aim to establish the following critical drivers;

- **Providing SC rating tool**

Government should develop a SC measurement and voluntary rating mechanism for all construction projects to be used during the assessment of all proposed projects during approval for issuance of construction permits.

- **Use of renewable resources as opposed to non-renewable resources and reduction in the use of natural resources**

The developed legal and infrastructure frameworks should impose a restriction on the use of natural resources aimed at reducing their use. Furthermore, government should exert

direct influence on the academic and research institutions to put more emphasis on SC in their curriculum and research, aimed at achieving alternatives to the available natural resources.

- **High return on investment**

Establishment of tax incentives to developers undertaking SC projects, manufacturers and importers of SC materials etc. will lead to an increase in the return on investment of sustainable construction projects.

- **Financial affordability by society**

Government should set up a SC development fund to enable developers and contractors involved in SC easily access funds for sustainable projects to enhance financial affordability.

- **Utilizing local resources including labor and materials during construction**

Government should exert restrictions on the percentages of imported labor and materials to be used on a particular project, above which, a particular proposed project should not exceed. This will create adequate opportunities to local labor and encourage the use of local materials.

- **Increased demand for environmentally friendly buildings**

Government should exert direct influence on professional and industrial organizations to guide and encourage their members to embrace SC practices. Furthermore, it should take the lead in embracing SC by ensuring that all government projects fulfill the requirements of a sustainable project as spelt out in the legal framework.

4.7.2.2 Institutional level

At the institution level, two categories of sectors are required to work in an integrated manner to ensure the implementation of sustainable building practices. The first of these sectors are the academic and research institutions including universities, colleges etc. The second sector is the professional bodies including UIPE, ISU, USA, NAPE, UNABCEC etc. These institutions will help in alleviating the following barriers;

- **Lack of strategy for promotion of SC**

Academic institutions should carry out research aimed at developing effective strategies for promotion of sustainable construction in Uganda.

- **Limited public awareness coupled with limited knowledge and information about SC**

Academic institutions should streamline their academic curriculum to focus on offering adequate training and awareness of SC to learners. Professional bodies should also organize regular continuous development trainings for their members aimed at bridging the knowledge gap on SC.

- **Limited demand from the market**

Professional bodies should exert pressure onto their members i.e. contractors, project managers, developers, architects etc. to adopt SC techniques in all their operations including design, construction, operation etc. in line with the established legal framework.

The institutional strategy should aim to establish the following critical drivers;

- **Use of renewable resources as opposed to non-renewable resources and reduction in the use of natural resources during construction**

Academic institutions should carry out adequate research on renewable resources and alternatives to natural resources that can be used in SC to ensure a reduction in the use of natural and non-renewable resources.

- **Improving indoor environmental quality**

Through research and training, academic institutions should impart professionals with knowledge on how to design and construct buildings with an improved air quality as compared to the conventional buildings.

- **Utilizing local resources including labor and materials during construction**

Academic institutions and professional bodies should ensure that professionals have the right skills and knowledge for employment on sustainable projects. This can be achieved through education and continuous career development trainings. Furthermore, through research, academic institutions can identify local materials that can be ably used in SC projects.

- **Financial affordability by society**

Through research, cheaper materials and methods for use in sustainable projects can be identified. These cheaper materials and methods will lower the cost of establishing sustainable projects thus increasing their financial affordability by society.

- **Increased demand for environmentally friendly buildings**

Through increasing awareness of the benefits of SC to the professionals, the demand for environmentally friendly buildings can be increased. This can be achieved through organizing awareness seminars for professionals, offering training and education on SC etc.

- **Operations of a sustainable building being compatible with local needs**

The performance of a sustainable building, including its design and construction should be formulated to meet the local needs of the people. This can be achieved through research and training by the academic and professional bodies through training professionals on sustainable designs and construction processes that are compatible with the local needs.

4.7.2.3 Executive level

At the third level is the executive level which includes the private sector e.g. manufacturers, contractors, developers etc. The executive level shall be responsible for alleviating the following barriers;

- **Higher investment cost in terms of materials, equipment etc.**

The manufacturers should manufacture and supply cheap sustainable materials for use in construction projects. This can be through recycling of construction and demolition waste coupled with other technologies. This will lead to a reduction in investment costs of sustainable projects.

- **Limited demand from the market**

The executive level should increase demand by activating the market movement to cause demand for environmentally friendly buildings. This can be through investing in environmentally friendly buildings and materials.

The executive level shall also be responsible for establishing the following drivers to sustainable construction;

- **Use of renewable resources as opposed to non-renewable resources and reduction in the use of natural resources during construction**

Developers and contractors should commit to the use of renewable resources and effect a reduction in the use of natural resources. Furthermore, manufacturers should undertake to develop and manufacture alternative materials for construction as a remedy to cause a reduction in the use of non-renewable and natural resources.

- **Utilizing local resources including labor and materials during construction**

Developers should also commit to employing a specified percentage of local labor and utilizing more local construction materials as opposed to imported materials.

- **Increased demand for environmentally friendly buildings**

The executive level should increase demand by activating the market movement to cause demand for environmentally friendly buildings. This can be through investing in environmentally friendly buildings and materials.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter entails summary of the findings from which conclusion and recommendations were generated.

5.1 Conclusions

The study on sustainable construction in Uganda reveals important findings that can guide efforts to promote its wider adoption.

The study revealed a high level of awareness of SC among construction professionals in Uganda, with 98.16% of respondents indicating familiarity with the concept. However, the interpretation of SC was predominantly associated with environmental sustainability. This is evidenced by the fact that statements reflecting environmental aspects of SC received the highest mean scores, followed by those related to economic sustainability, and lastly, social sustainability. These findings suggest that while awareness of SC is widespread, it is largely framed within an environmental context. The study therefore concludes that although a high level of awareness does not necessarily translate into widespread adoption of sustainable construction practices, the existing knowledge base provides a favourable foundation for promoting SC initiatives. Such initiatives are likely to be well-received and understood by industry professionals. Policymakers should therefore build on the strong environmental awareness among professionals to gradually integrate economic and social sustainability dimensions into practice.

The study concludes that the widespread adoption of SC in Uganda is significantly impeded by several critical barriers, including insufficient market demand, lack of strategic direction, limited government support, and high initial costs. Addressing these challenges requires a multi-pronged policy response. First, the development of a national sustainable construction strategy is essential to guide industry transformation. Second, government agencies must take a leading role in promoting SC through supportive legislation, incentives, and pilot projects. Third, public awareness campaigns and stakeholder engagement initiatives can help foster understanding and acceptance of SC. Finally, innovative financing mechanisms—such as green bonds, concessional loans, and public-private partnerships—should be introduced to address economic barriers and encourage investment in sustainable practices.

On the other hand, the study establishes that while barriers to sustainable construction remain, Uganda possesses a number of promising drivers that can be harnessed to promote widespread adoption of SC practices. These include high return on investment, improved environmental performance, and increasing awareness of the benefits of sustainable buildings etc. Capitalizing on these drivers will require deliberate policy and institutional support. Government and industry bodies should lead efforts to communicate the long-term financial and environmental advantages of SC to stakeholders. Government should also establish nationally recognized sustainability certification systems to guide and legitimize SC practices. Policies should encourage the use of locally sourced and renewable construction materials, backed by research and incentives. Public-sector procurement policies can serve as a tool to stimulate demand for sustainable buildings.

Ensure that policies and building guidelines consider the socio-economic and climatic context to enhance acceptance and relevance.

In line with the study's findings, a framework was developed to support the promotion and adoption of sustainable construction in Uganda. This framework reflects the empirical insights gathered and identifies key institutions and stakeholders, outlining their specific roles at the national, institutional, and implementation levels. It is grounded in the study's conclusions regarding the critical drivers, barriers, and policy gaps affecting sustainable construction. The proposed framework emphasizes coordinated stakeholder engagement, policy coherence, and institutional responsibility as essential components for achieving widespread adoption. The study concludes that implementing this framework can provide a structured and context-specific pathway for advancing sustainable construction practices across Uganda.

5.2 Recommendations

From the above conclusions, the study makes the following recommendations;

- (i) Given that many professionals predominantly conceptualize sustainable construction through the lens of environmental sustainability, this prevailing understanding can be strategically leveraged as an initial entry point for broader advocacy and policy promotion of sustainable construction in Uganda. This approach aligns with existing awareness while gradually integrating social and economic dimensions, as emphasized in the triple bottom line framework (Elkington, 1997). To achieve this, government and stakeholders in the

construction industry should use the existing environmental policy framework, such as the National Environmental Act and the Environmental Impacts Assessment regulations.

(ii) Collaboration and Partnerships: Effective promotion of sustainable construction in Uganda requires coordinated collaboration among government agencies, industry associations, professional bodies, and other key stakeholders. Establishing institutionalized platforms for knowledge exchange, networking, and multi-stakeholder engagement can enhance the dissemination of best practices, lessons learned, and innovative approaches. Such collaboration facilitates collective problem-solving and fosters the development of joint initiatives that address systemic challenges, thereby strengthening industry-wide commitment to sustainable construction. This aligns with principles of participatory governance and sector-wide approaches, which emphasize shared responsibility and mutual accountability (UN-Habitat, 2012).

(iii) This study is limited by its geographic and professional scope, as data were collected primarily from construction professionals based in Kampala and Wakiso districts. Consequently, the views of stakeholders in other regions, as well as those from non-professional or community-based perspectives, were not captured. These limitations restrict the generalizability of the findings and highlight the need for broader, more inclusive future studies by academic institutions and government.

- (iv) Academic and research institutions should prioritize studies that combine stakeholder perspectives with in-depth documentary analysis of sustainability policies, national building codes, and environmental performance data. This mixed-methods approach would enhance the scientific rigor of sustainability research and generate evidence that can inform curriculum development, policy engagement, and innovation in green building technologies and practices.
- (v) It is recommended that future research undertake empirical testing and validation of the proposed framework through pilot implementations or stakeholder-based evaluations within the construction sector. Such practical application would provide valuable insights into the framework's effectiveness, adaptability, and impact on overcoming barriers and enhancing drivers of sustainable construction in Uganda. Additionally, iterative refinement based on feedback from practitioners and policymakers would strengthen the framework's relevance and usability. This process will ensure that the framework not only remains theoretically robust but also becomes a practical tool that can meaningfully guide policy formulation, institutional collaboration, and on-the-ground sustainable construction initiatives.

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- (i) Diploma/College (iii) Bachelor's Degree
- (ii) Post-graduate Diploma (iv) Masters Degree
- (v) Doctorate

4. How many years of experience do you have?

- (i) Less than 2 years (iii) 2 – 5 years
- (ii) 6– 9 years (iv) 10 and above

5. Current location of employment

.....

.....

6. Job post/Designation

.....

SECTION B: LEVEL OF AWARENESS AND INTERPRETATION OF SUSTAINABLE CONSTRUCTION

Please indicate the extent (in your own understanding and awareness) to which you agree with each of the following interpretation(s) of sustainable construction on a scale of 1-5 by ticking the appropriate boxes with the following representation; Where: 1 – Strongly disagree, 2 – Disagree, 3 – Slightly agree, 4 – Agree and 5 – Strongly agree.

You can as well choose the “**No idea**” (if you have no idea about the concept of sustainable construction) or “**None of the above**” (if all the given statements, in your own understanding do not give a close interpretation of Sustainable construction) option(s) appropriately.

CODE	INTERPRETATION OF SUSTAINABLE CONSTRUCTION	LIKERT SCALE				
		1	2	3	4	5
LA 1	Construction practices that enhance environmental protection such as avoiding construction in wetlands and reducing greenhouse emissions.					
LA 2	Construction practices that minimize over usage of natural resources such as water, sand, stones.					
LA 3	Construction practices that generate profits without compromising people’s future needs.					

LA 4	Construction practices that ensure minimal lifetime maintenance costs of the building.					
LA 5	Construction practices that promote quality of life and human satisfaction such as promoting safety at workplace					
LA 6	Construction practices that practice corporate social responsibility					
LA 7	No idea					
LA 8	None of the above					

SECTION C: BARRIERS TO SUSTAINABLE CONSTRUCTION IN UGANDA

Please indicate the extent to which you agree with each of the barriers to sustainable construction in Uganda, on a scale of 1-5 by ticking the appropriate boxes with the following representation; Where: 1 – Strongly disagree, 2 – Disagree, 3 – Slightly agree, 4 – Agree and 5 – Strongly agree.

CODE	HYPOTHESIZED BARRIERS	LIKERT SCALE				
		1	2	3	4	5
GB	Governance/Institutional barriers					
GB 1	Lack of or insufficient government support					

GB 2	Inefficient building codes and regulations					
GB 3	Legal prohibitions and bans on sustainable materials and technologies					
GB 4	Weak enforcement of laws and regulations					
GB 5	Lack of strategy for promotion of Sustainable Construction					
GB 6	Cumbersome procedures to obtain approvals					
GB 7	Lack of incentives from government					
GB 8	Conflicting government priorities					
EB	Economic barriers					
EB 1	Higher investment cost in terms of materials, special storage, equipment, operation and long construction					
EB 2	Cost estimates inaccuracy/ uncertainty					
EB 3	Long payback period					
EB 4	Lack of financing schemes from financial institutions that support sustainable construction rather than the traditional					
EB 5	Limited local suppliers of sustainable building material thus the need for importation of materials and technologies from suppliers in foreign markets					
SB	Social/Cultural barriers					
SB 1	Limited public awareness coupled with limited knowledge and information about Sustainable Construction					

SB 2	Limited demand from the market including companies and society					
SB 3	Change resistance from conventional to sustainable					
SB 4	Limited knowledge of benefits from Sustainable					
SB 5	Sustainable construction practices are time consuming					
PB	Professional barriers					
PB 1	Limited professional knowledge and expertise					
PB 2	Lack of and limited knowledge of technologies					
PB 3	Increased documentation					
PB 4	Lack of sustainable projects as demonstrations					
PB 5	Uncertainty of long-term performance					
PB 6	Lack of common understanding and interpretation of SC amongst the various stakeholders of construction projects					
PB 7	Lack of training and education					
PB 8	International SC design standards not being adapted to fit local needs					

SECTION D: DRIVERS TO SUSTAINABLE CONSTRUCTION IN UGANDA

Please indicate the extent to which you agree with each of the drivers to sustainable construction in Uganda, on a scale of 1-5 by ticking the appropriate boxes with the following representation; Where: 1 – Strongly disagree, 2 – Disagree, 3 – Slightly agree, 4 – Agree and 5 – Strongly agree.

CODE	HYPOTHESIZED DRIVERS	LIKERT SCALE				
		1	2	3	4	5
ED Environmental drivers						
ED 1	Reduction in the use of natural resources during construction including water, materials, energy etc.					
ED 2	Greater recycling of products					
ED 3	Improving indoor environmental quality					
ED 4	Improving water efficiency of buildings					
ED 5	Use of renewable resources as opposed to non-renewables resources					
ED 6	Minimize pollutants that cause environmental degradation					
ED 7	Providing Sustainable Construction measurement and voluntary rating/ certification					
ED 8	Waste reduction					
ED 9	Greater availability and affordability of Sustainable Construction materials					
ED 10	Development of comprehensive data bases					
ED 11	Enforcement of compliance with environmental regulation					
EC Economic drivers						
EC 1	Financial affordability by the society					
EC 2	Employment creation (labor intensive construction)					

EC 3	Enhancing market value and marketability of buildings					
EC 4	High return on investment					
EC 5	Choosing environmentally compliant responsible suppliers/contractors					
EC 6	Providing incentives to those applying a sustainability measure					
EC 7	Utilizing local resources including labor and materials during construction					
EC 8	Competitiveness through promotion of sustainability					
ES	Social drivers					
ES 1	Poverty alleviation					
ES 2	Increased health and safety at workplace					
ES 3	Operations of a Sustainable building being compatible with local needs					
ES 4	Increased demand for environmentally friendly buildings					
ES 5	Increased education and training on Sustainable Construction to increase awareness, developing capacity, skills and policy monitoring system					
ES 6	Improving government support through policies and regulations directed towards enhancing SC					

“THANK YOU FOR YOUR CONTRIBUTION TO MY STUDY”

(ii) 6– 9 years

(iv) 10 and above

5. Current location of employment

.....

6. Job post/Designation

.....

SECTION B: REQUIRED INFORMATION

1. How would you rate your level of awareness of SC on a scale of 1 to 5?

2. What are the barriers to SC in Uganda?

3. What are the drivers to SC in Uganda?

4. What do you think can be done to promote the wider adoption of SC in Uganda?

TABLE A1: RESEARCH WORK PLAN

Period/Months	JANUARY –			JUNE – DECEMBER 2023					
Description of works	MAY 2023			AND JAN – MARCH 2024					
Review of relevant literature									
Research title/topic submission									
Proposal development, experiment and									
Proposal review & submission									
Questionnaire development									
Data collection									
Analysing and interpretation of the results									
Draft report writing									
Final report									
Presentation									

TABLE A2: BUDGET

ITEM	QUANTITY	RATE(UGX)	AMMOUNT(UGX)
Stationery	1	200,000	200,000
Data (Internet)	1	300,000	300,000
Library fess	1	300,000	300,000
Transport	1	2,000,000	2,000,000
Airtime	1	300,000	300,000
Software packages	1	800,000	800,000
Printing /binding	1	500,000	500,000
Logistics	1	1,000,000	1,000,000
Miscellaneous	1	700,000	700,000
TOTAL			5,900,000

TABLE A3: LAWSHE TABLE FOR DETERMINING CONTENT VALIDITY RATIO (CVR)

Number of Professionals	Minimum CVR value
5	0.99
6	0.99
7	0.99
8	0.78
9	0.75
10	0.62

Source: Lawshe (1975)

TABLE A4: CRONBACH'S α VALUE

Cronbach's α	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.8 \leq \alpha \leq 0.9$	Good
$0.7 \leq \alpha \leq 0.8$	Acceptable
$0.6 \leq \alpha \leq 0.7$	Questionable
$0.5 \leq \alpha \leq 0.6$	Poor
$\alpha \leq 0.5$	Unacceptable

Source: Anastasi (1985)