KWARA STATE POLYTECHNIC

CRITICAL ANALYSIS OF SUSTAINABLE BUILDING SERVICES AND THEIR IMPACT ON HEALTHCARE FACILITY CONSTRUCTION IN NIGERIA

By

IBRAHEEM ABDULJELIL OLAREWAJU

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CERTIFICATION

This is to certify that the research titled Stakeholders Perception on Performance Measure for Construction Partnering Project was carried out by Ibraheem Abduljelil Olarewaju with matriculation number HND/23/FT/QTS/0038 has been read and approved as meeting the requirements for the award Higher National Diploma (HND) In Quantity Surveying, Kwara state polytechnic, Ilorin, Nigeria.

ADEOTI BASHIR OLANREWAJU ----------

(Project Supervisor) Signature and Date

QS SIDEEQ LATEEF ----------

(Head of Department) Signature and Date

QS AISHA OMAR MUAZU ----------

(Project Coordinator) Signature and Date

QS. (DR) ADAMU MUDI (FNIQS, RQS ----------

(External Examiner) Signature and Date

DEDICATION

This project is dedicated to the Almighty Allah, the Most Gracious, the Most Merciful, for granting me life, strength, wisdom, and the opportunity to complete this academic journey.

To my beloved parents and guardians, whose prayers, love, and unwavering support have been my greatest source of motivation thank you for believing in me even when the road was tough.

To my siblings and family members, thank you for your encouragement and kind words throughout this journey.

I also dedicate this work to all the lecturers and mentors who guided me with their knowledge and wisdom, and to my colleagues and friends whose companionship and collaboration made the process more meaningful.

Finally, this work is dedicated to every student who dares to dream, perseveres through challenges, and strives for excellence in the pursuit of knowledge.

DECLARATION

I hereby declare that this Research work, which I submit to the Department of Quantity Surveying, Institute of environmental studies, Kwara state polytechnic, Ilorin, Kwara state, Nigeria, examination in consideration of the award of a Higher National Diploma in Quantity Surveying in an original work undertaken by me Ibraheem Abduljelil Olarewaju.

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Ibraheem Abduljelil Olarewaju DATE

(HND/23/FT/QTS/0038)

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Contents

ABSTRACT

This study critically examines the implementation and impact of sustainable building services in the construction of healthcare facilities in Nigeria. As global emphasis shifts toward environmentally responsible construction, the integration of sustainability in healthcare infrastructure has become essential for improving energy efficiency, reducing operational costs, and enhancing patient and staff well-being. The research employed a descriptive survey design and collected data through structured questionnaires distributed to construction and healthcare professionals across key Nigerian cities. Out of 120 questionnaires distributed, 111 valid responses were analyzed.

The findings reveal that while awareness of sustainable practices is high, their adoption remains moderate. Solar energy systems, energy-efficient HVAC installations, and natural ventilation are among the most commonly implemented strategies. Respondents identified significant positive impacts on energy cost reduction, operational efficiency, environmental protection, and patient comfort. However, widespread adoption is hindered by high implementation costs, lack of skilled professionals, inadequate government support, and weak regulatory frameworks.

The study concludes that sustainable building services are vital to the future of healthcare construction in Nigeria. It recommends increased government incentives, enforcement of green building codes, capacity building, public awareness campaigns, and public-private partnerships to promote sustainability. The research contributes to the growing discourse on sustainable development in Nigeria's built environment and offers a roadmap for integrating green practices into healthcare infrastructure.

CHAPTER ONE

INTRODUCTION

Sustainable building services have gained global attention due to the increasing awareness of climate change, resource depletion, and the need for efficient energy consumption in construction. In developing countries like Nigeria, the healthcare sector is particularly impacted by inefficiencies in building services, which often result in high operational costs, poor patient outcomes, and unsustainable energy usage (Adeniran & Olagunju, 2023). Sustainable building practices in healthcare facilities involve integrating energy-efficient designs, renewable energy sources, waste management strategies, and water conservation techniques to create an eco-friendly environment that enhances healthcare delivery.

In Nigeria, healthcare facilities face significant challenges, including unreliable electricity supply, inadequate ventilation, and inefficient water management systems. These challenges not only affect patient comfort but also impact medical equipment functionality, leading to increased mortality rates due to infrastructure failures (Adisa & Okonkwo, 2023). Therefore, adopting sustainable building services in healthcare construction is not just a necessity but a strategic approach toward enhancing the overall efficiency of the sector.

The construction industry, being a major contributor to environmental degradation, needs to embrace sustainable development principles to reduce its ecological footprint. Sustainable healthcare facilities can help mitigate environmental challenges by utilizing energy-efficient lighting, solar power, natural ventilation, and eco-friendly materials (Agbede & Hassan, 2023). However, the implementation of such practices in Nigeria has been slow due to financial constraints, lack of technical expertise, and inadequate policy frameworks. This study seeks to critically analyze how sustainable building services can impact healthcare facility construction in Nigeria, addressing the existing gaps and proposing practical solutions for improved healthcare infrastructure.

1.1 BACKGROUND TO THE STUDY

The need for sustainable building services in healthcare facilities has become increasingly important as urbanization, population growth, and climate change exert pressure on existing healthcare infrastructure. In developed nations, sustainable healthcare buildings have significantly reduced operational costs and improved environmental performance, yet Nigeria still lags behind in adopting these principles (Alabi & Adeoye, 2023). The growing demand for improved healthcare services necessitates the integration of sustainable practices in hospital construction to enhance energy efficiency, waste management, and overall environmental quality.

The current state of Nigerian healthcare infrastructure highlights the urgency of sustainable interventions. Most public hospitals rely on diesel generators due to erratic electricity supply, which increases carbon emissions and maintenance costs (Jibril & Sadiq, 2023). Furthermore, outdated plumbing systems and inefficient water use contribute to water scarcity issues, affecting hygiene and patient care. Incorporating modern water recycling systems and sustainable drainage solutions can significantly improve the efficiency of hospital operations (Afolabi & Olayemi, 2022).

Globally, sustainable construction practices have transformed healthcare infrastructure by focusing on green building certifications, energy conservation, and eco-friendly materials. Countries like Germany and the United Kingdom have developed healthcare buildings that utilize renewable energy, smart HVAC systems, and intelligent waste management technologies to optimize efficiency (Eze & Nwosu, 2024). If Nigeria follows a similar trajectory, the healthcare sector can experience enhanced patient outcomes, lower energy consumption, and reduced operational costs. However, the absence of clear policies and incentives for green building implementation remains a major bottleneck in the country (Osagie & Adebisi, 2023).

This study seeks to examine the current trends in sustainable healthcare construction, the barriers to its implementation in Nigeria, and how policymakers, construction professionals, and healthcare administrators can collaborate to develop a robust framework for sustainable healthcare facilities.

1.2 STATEMENT OF RESEARCH PROBLEM

The Nigerian healthcare sector is plagued by numerous infrastructural challenges, ranging from unreliable energy supply to inadequate water management and poor indoor air quality. These issues are exacerbated by outdated construction practices that fail to incorporate sustainability principles. As a result, many healthcare facilities experience high maintenance costs, inefficiencies in resource utilization, and adverse environmental impacts (Ayodeji & Onifade, 2023).

One of the critical issues is the reliance on non-renewable energy sources. Most healthcare facilities in Nigeria depend on diesel generators due to inconsistent electricity supply from the national grid. This not only increases operational costs but also contributes to air pollution and environmental degradation (Olowokere & Adeyemo, 2023). Sustainable energy solutions, such as solar power and energy-efficient lighting systems, remain underutilized despite their proven benefits in reducing electricity costs and enhancing environmental sustainability.

Another pressing concern is waste management. Many Nigerian hospitals lack proper waste disposal mechanisms, leading to the improper handling of medical and hazardous waste. This poses significant health risks to patients, healthcare workers, and the surrounding communities (Gana & Ibrahim, 2022). Sustainable waste management strategies, such as recycling and proper biomedical waste treatment, are essential for minimizing environmental pollution and ensuring a safe healthcare environment.

Water conservation and indoor air quality are also major challenges in Nigerian healthcare facilities. Inefficient plumbing systems result in significant water wastage, while inadequate ventilation contributes to poor indoor air quality, increasing the risk of airborne diseases among patients and staff (Akintunde & Ogunbanjo, 2023). Sustainable water management strategies, such as rainwater harvesting and water-efficient fixtures, can help address these issues, yet their adoption in Nigeria remains minimal.

Furthermore, the lack of policies and incentives for sustainable construction in healthcare facilities has hindered progress in adopting green building practices. Many healthcare institutions operate on tight budgets, making it difficult to invest in sustainable technologies and materials (Ahmed &

Bello, 2024). Without adequate government support, sustainable healthcare construction will continue to face significant barriers.

Given these challenges, this study aims to conduct a critical analysis of sustainable building services and their impact on healthcare facility construction in Nigeria. The research will identify key sustainability factors, examine current practices, and propose recommendations to improve the implementation of sustainable solutions in the healthcare sector.

1.3 RESEARCH QUESTIONS

1. What is the current state of sustainable building practices in Nigerian healthcare facilities?
2. What is the impact of sustainable building services on the operational efficiency of healthcare facilities?
3. What are the challenges hindering the adoption of sustainable building services in Nigeria's healthcare sector?

1.4 AIM AND OBJECTIVES

1.4.1 AIM

The aim of this study is to critically analyze the role of sustainable building services in healthcare facility construction in Nigeria, with a focus on their impact on energy efficiency, resource management, and overall healthcare delivery. The study seeks to identify the challenges, benefits, and practical solutions for integrating sustainable construction practices into the healthcare sector to enhance operational efficiency, environmental sustainability, and patient well-being (Ojo & Okeke, 2023).

1.4.2 OBJECTIVES OF THE STUDY

To achieve the stated aim, the study will focus on the following objectives:

1. To assess the current state of sustainable building practices in Nigerian healthcare facilities
2. To analyze the impact of sustainable building services on the operational efficiency of healthcare facilities

3. To identify the challenges hindering the adoption of sustainable building services in Nigeria's healthcare sector

1.5 SCOPE AND LIMITATIONS

1.5.1 SCOPE OF THE STUDY

This study focuses on sustainable building services in the construction of healthcare facilities in Nigeria. The scope is divided into various aspects that will be critically analyzed to understand the effectiveness, challenges, and potential improvements in implementing sustainable construction practices in the healthcare sector.

1. Geographical Scope: The study will focus on healthcare facility construction across Nigeria, covering urban and rural hospitals, primary healthcare centers, and specialized medical institutions, It will assess the implementation of sustainable building practices in different regions to determine regional variations in adoption, challenges, and success rates
2. Conceptual Scope: The study will explore key sustainable building services, including:

Energy efficiency (use of renewable energy, solar panels, smart grids, and energy-efficient HVAC systems).

Water conservation (rainwater harvesting, greywater recycling, and low-flow plumbing fixtures).

Waste management (proper disposal of medical waste, recycling, and eco-friendly materials).

Indoor environmental quality (ventilation, air quality, noise control, and patient comfort).

Use of sustainable materials (bamboo, recycled steel, low-carbon concrete, and eco-friendly insulation).

The research will assess how these elements contribute to improving operational efficiency, cost-effectiveness, and patient well-being in healthcare settings (Eze & Nwachukwu, 2023).

3. Technical Scope: This study will analyze case studies of existing healthcare facilities in Nigeria that have implemented sustainable building services, It will review construction

methodologies, building materials, architectural designs, and engineering solutions used to enhance sustainability in hospitals and clinics (Ogundele & Adeyemi, 2023).

4. Stakeholder Scope: The study will involve key stakeholders in the healthcare and construction industries, including:

Architects and engineers specializing in sustainable healthcare design.

Government agencies and policymakers involved in healthcare infrastructure development.

Hospital administrators and facility managers responsible for maintenance and operations.

Patients and healthcare professionals who experience the direct impact of sustainable building services (Adebayo & Yusuf, 2023).

1.5.2 LIMITATIONS OF THE STUDY

While this study aims to provide a comprehensive analysis of sustainable building services in healthcare facility construction, several limitations may affect the research findings:

1. Data Availability and Accessibility: Limited access to reliable data on sustainable practices in Nigerian hospitals, as many institutions do not maintain detailed sustainability records, Confidentiality restrictions on certain hospital infrastructure details, making it difficult to obtain first-hand information
2. Financial Constraints: Conducting a nationwide study requires extensive financial resources, which may limit the number of healthcare facilities analyzed, High costs associated with field surveys, expert consultations, and data collection may affect the study's depth (Umar & Bello, 2023).
3. Time Constraints: Given the time frame for project completion, the study may not be able to track long-term sustainability performance in healthcare facilities, The dynamic nature of sustainability policies means that new developments may emerge after the study is completed, limiting its applicability over time (Nwosu & Olatunde, 2023).
4. Scope of Coverage: While the study aims to cover healthcare facilities across Nigeria, logistical challenges may restrict field research to selected states or regions (Fashola &

Ogunbiyi, 2023). The focus will primarily be on public hospitals and major private healthcare providers, which may not fully represent smaller healthcare centers

5. Resistance to Change: Some hospital administrators and construction professionals may lack awareness or have low interest in sustainable building practices, affecting the quality of responses during interviews or surveys, Reluctance to share information due to concerns over competitive advantage or regulatory scrutiny may limit access to primary data

1.5 JUSTIFICATION FOR THE STUDY

The justification for this study is rooted in the urgent need to enhance sustainability in healthcare facility construction in Nigeria. The following points highlight its significance:

1. Addressing Energy and Resource Efficiency Challenges: Hospitals and healthcare facilities are among the largest consumers of energy in Nigeria due to their 24/7 operations, Sustainable building services can reduce operational costs, enhance energy security, and promote environmentally friendly healthcare infrastructure
2. Improving Healthcare Facility Performance: Poorly designed hospitals suffer from inefficient ventilation, poor air quality, and excessive energy consumption, Implementing sustainable solutions can enhance patient recovery rates, reduce healthcare-associated infections (HAIs), and improve working conditions for medical professionals
3. Contribution to Policy Development: There is limited research on sustainable building services in healthcare construction in Nigeria, making this study valuable for policymakers and regulatory bodies. The study's findings will provide evidence-based recommendations for improving government regulations on healthcare construction sustainability
4. Economic and Social Benefits: Sustainable healthcare facilities can lower long-term maintenance costs, reduce reliance on fossil fuels, and create green jobs in the construction industry, Sustainable hospital designs enhance community resilience, particularly in rural and underserved areas, where access to quality healthcare is limited
5. Bridging the Knowledge Gap: Many Nigerian construction firms and healthcare administrators lack awareness of sustainable building technologies.This study will provide practical insights into the best strategies for integrating sustainability into hospital designs.

1.6 DEFINITION OF TERMS

1.6.1 **Sustainable Building Services**

These refer to the systems and processes integrated into a building's design, construction, and operation to minimize environmental impact, conserve resources, and enhance occupants' well-being. In healthcare facilities, this includes energy-efficient HVAC systems, water-saving plumbing, renewable energy technologies, and waste management solutions.

1.6.2 **Healthcare Facility**

A healthcare facility is any location where medical care is provided, including hospitals, clinics, diagnostic centers, and specialized treatment institutions. These buildings require specific design and service considerations to meet health, safety, and hygiene standards.

1.6.3 **Construction**

Construction refers to the planning, designing, and building of infrastructure or buildings. In the context of this study, it focuses on the development of healthcare facilities in Nigeria, with particular attention to integrating sustainable practices.

1.6.4 **Sustainability**

Sustainability in construction refers to building in a way that meets current needs without compromising the ability of future generations to meet theirs. It emphasizes efficiency in resource usage, environmental protection, and long-term performance.

1.6.5 **Building Services**

These are the mechanical and electrical systems that make a building functional and comfortable for its users. In healthcare construction, these services include lighting, power supply, air conditioning, plumbing, medical gas systems, fire safety systems, and communication systems.

1.6.6 **Impact**

In this context, impact refers to the effect or influence that sustainable building services have on the design, cost, functionality, performance, and environmental footprint of healthcare facility construction.

1.6.7 **Critical Analysis**

A critical analysis involves a detailed examination and evaluation of a subject to understand its strengths, weaknesses, effectiveness, and implications. Here, it relates to

the assessment of how sustainable building services contribute to or hinder healthcare construction in Nigeria.

1.6.8 Green Building

A green building is one designed and constructed using processes that are environmentally responsible and resource-efficient throughout its lifecycle. In healthcare, this means enhancing indoor environmental quality, reducing energy use, and minimizing waste.

1.6.9 Energy Efficiency

This refers to using less energy to provide the same level of service or output. In hospitals, energy-efficient lighting, ventilation, and equipment help lower operational costs and reduce environmental impact.

1.6.10 Nigeria

Nigeria is the geographical focus of this study. It is a West African country with a developing economy, diverse climate zones, and a healthcare system facing infrastructure and sustainability challenges.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of existing literature on sustainable building services and their impact on healthcare facility construction in Nigeria. It examines key concepts, theoretical perspectives, empirical studies, and gaps in knowledge concerning sustainability in healthcare construction.

2.2 Concept of Sustainable Building Services

Sustainable building services refer to the integration of environmentally responsible and resource-efficient systems into the design, construction, and operation of buildings. These services include energy-efficient heating, ventilation, and air conditioning (HVAC) systems, water conservation techniques, renewable energy utilization, and sustainable waste management. The adoption of sustainable building services aims to enhance the environmental performance of structures while ensuring the comfort and well-being of occupants (Kibert, 2016).

2.3 Importance of Sustainable Building Services in Healthcare Facilities

Healthcare facilities are critical infrastructures that require optimal environmental conditions to support medical operations and ensure the well-being of patients and healthcare workers. The integration of sustainable building services in healthcare construction provides several benefits, including:

- **Energy Efficiency**: Reduction in operational costs through optimized energy consumption (Ding, 2008).
- **Water Conservation**: Efficient use of water resources through low-flow fixtures and rainwater harvesting (Matos & Sousa, 2015).
- **Improved Indoor Air Quality**: Use of advanced HVAC systems to reduce pollutants and enhance patient recovery (Ulrich et al., 2008).
- **Waste Reduction**: Proper management of medical and non-medical waste to minimize environmental pollution (Ali & Al Nsairat, 2009).

- **Sustainable Materials**: Adoption of eco-friendly construction materials that reduce the carbon footprint (Akadiri et al., 2012).

2.4 Theoretical Framework

Several theories underpin the concept of sustainability in building services. Some of the relevant theories include:

2.4.1 Sustainable Development Theory

This theory emphasizes meeting present needs without compromising future generations' ability to meet theirs. It advocates for resource efficiency, environmental protection, and economic viability in construction practices (Brundtland Commission, 1987).

2.4.2 Green Building Theory

Green Building Theory focuses on designing and constructing buildings that have minimal negative impacts on the environment. It highlights the importance of energy efficiency, resource conservation, and occupant well-being (Cole, 2001).

2.4.3 Life Cycle Assessment (LCA) Theory

LCA evaluates the environmental impacts of building materials and systems throughout their entire lifecycle from extraction to disposal. This approach aids in selecting the most sustainable building services for healthcare facilities (ISO 14040, 2006).

2.5 Empirical Studies on Sustainable Building Services in Healthcare Facilities

Several studies have examined the implementation of sustainable building services in healthcare infrastructure worldwide.

2.5.1 Global Perspective

A study by Smith & Brown (2020) analyzed the impact of green building services on hospital efficiency in the United States, showing a 30% reduction in energy costs through the use of renewable energy systems. Similarly, research in Europe (Jones et al., 2021) demonstrated that

integrating natural ventilation and sustainable water management improved patient recovery rates and reduced hospital-acquired infections.

2.5.2 Nigerian Context

In Nigeria, research on sustainable healthcare infrastructure is still emerging. Studies by Adeyemi et al. (2019) highlight challenges such as inadequate funding, lack of skilled professionals, and poor regulatory enforcement. However, recent pilot projects, such as the adoption of solar energy in select hospitals, indicate a growing recognition of sustainability in healthcare construction.

2.6 Challenges of Implementing Sustainable Building Services in Nigerian Healthcare Facilities

Despite the benefits of sustainable building services, their adoption in Nigeria faces several challenges:

- **High Initial Costs**: The capital investment required for green technologies is often prohibitive (Odediran et al., 2012).
- **Lack of Awareness and Expertise**: Limited knowledge among construction professionals and stakeholders (Ofori, 2007).
- **Inconsistent Government Policies**: Weak enforcement of building codes and sustainability standards (Ibem & Laryea, 2014).
- **Infrastructure Deficiencies**: Poor electricity supply and water management systems hinder sustainability efforts (Adebayo, 2013).

2.7 Strategies for Enhancing Sustainable Building Services in Healthcare Construction

To overcome these challenges, the following strategies should be considered:

- **Government Incentives**: Tax reliefs and subsidies for sustainable building projects (Zhang et al., 2011).
- **Capacity Building**: Training programs for architects, engineers, and policymakers on green building practices (Ajayi et al., 2015).

- **Public-Private Partnerships (PPPs)**: Collaboration between government agencies and private firms to fund and implement sustainable healthcare infrastructure (World Bank, 2016).
- **Policy Strengthening**: Enforcing stricter regulations on building sustainability standards (Darko & Chan, 2017).

2.8 Research Gaps

While existing studies highlight the importance of sustainability in healthcare construction, there is a lack of comprehensive research focused on Nigeria. Key gaps include:

- Limited empirical data on the long-term cost-benefit analysis of sustainable hospital designs.
- Insufficient studies on the social and health impacts of sustainable healthcare facilities in Nigeria.
- Lack of standardized frameworks for integrating green technologies in healthcare construction.

2.9 Conclusion

This chapter has reviewed literature on sustainable building services, their significance in healthcare facility construction, theoretical perspectives, empirical studies, challenges, and strategies for implementation. The next chapter will discuss the research methodology adopted for this study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the methodology employed in conducting the research. It provides a detailed description of the research design, population and sampling techniques, data collection methods, research instruments, validity and reliability of instruments, method of data analysis, and ethical considerations.

3.2 Research Design

The study adopts a **descriptive survey research design** to critically analyze the role of sustainable building services in the construction of healthcare facilities in Nigeria. This design is suitable for assessing the current practices, challenges, and impacts of sustainable services in real-life construction projects.

3.3 Population of the Study

The population of the study comprises professionals in the Nigerian construction industry, particularly those involved in healthcare facility projects. These include architects, engineers, quantity surveyors, facility managers, and hospital administrators in selected cities such as Lagos, Abuja, and Port Harcourt.

3.4 Sample Size and Sampling Technique

A purposive sampling technique is employed to select relevant stakeholders with direct involvement or expertise in sustainable building and healthcare construction. The target sample size is 120 respondents, distributed across the professional categories and regions.

3.5 Sources of Data

The study utilizes both **primary** and **secondary data**:

- **Primary Data**: Gathered through structured questionnaires and interviews with key stakeholders.

- **Secondary Data**: Extracted from academic journals, government publications, textbooks, and online databases related to sustainability and healthcare infrastructure.

3.6 Research Instrument

The main research instrument is a **structured questionnaire** designed to gather quantitative and qualitative information on sustainable building services. The questionnaire is divided into sections covering demographic information, awareness and application of sustainable practices, and perceived impacts on healthcare construction.

3.7 Validity and Reliability of Instruments

To ensure validity, the questionnaire is reviewed by experts in construction management and sustainability. A pilot study is also conducted with 10 professionals to refine the instrument. Reliability is tested using the Cronbach's Alpha method, with a coefficient of 0.78 indicating acceptable internal consistency.

3.8 Method of Data Collection

Data collection involves both physical administration of questionnaires and online distribution through email and professional forums. Follow-up phone calls and interviews are conducted to ensure high response rates and clarify ambiguous responses.

3.9 Method of Data Analysis

Collected data is analyzed using descriptive statistics (mean, frequency, percentage) and inferential statistics (chi-square and regression analysis) with the aid of Statistical Package for the Social Sciences (SPSS) version 25. Findings are presented using tables and charts for clarity.

3.10 Ethical Considerations

Ethical standards are maintained throughout the study. Participants are assured of the confidentiality **and** anonymity of their responses. Informed consent is obtained from all respondents, and participation is strictly voluntary. The research adheres to institutional and national research ethics guidelines.

3.11 Conclusion

This chapter has detailed the methodology adopted in assessing the impact of sustainable building services on healthcare facility construction in Nigeria. The next chapter will present and analyze the data collected during the research.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter presents and analyzes the data collected through the administered questionnaire. Out of the 120 questionnaires distributed, 111 were duly completed and returned, representing a 92.5% response rate. The analysis is structured according to the questionnaire sections: demographic data, current state of sustainable practices, impacts, challenges, and recommendations. The data are presented in tables and percentages for clarity.

4.2 Demographic Information of Respondents

This section presents the demographic characteristics of the 111 respondents who participated in the study. The data covers gender, age, professional background, years of experience, and location of work.

Gender Distribution**:** Out of the 111 respondents, **74 (66.7%) were male**, while **37 (33.3%) were female**. This reflects the male-dominated nature of the construction and healthcare infrastructure sectors in Nigeria, particularly in technical and managerial roles.

Age Distribution**:** The age range of respondents indicates a relatively young and active professional group. The majority fall within the 26–35 age group (42 respondents, 37.8%), followed closely by 36–45 years (36 respondents, 32.4%). Respondents under 25 years accounted for 11.7%, while those above 45 years were 18.0%. This distribution suggests a good mix of youthful energy and experienced professionals contributing to the study.

Professional Background: Respondents came from a variety of professional disciplines relevant to healthcare facility construction. The majority were Quantity Surveyors (34 respondents, 30.6%), followed by Engineers (28 respondents, 25.2%), and Architects (16 respondents, 14.4%). Other participants included Facility Managers (10.8%), Hospital Administrators (9.9%), and a small number (9.0%) from other related professions. This diversity ensures a balanced perspective across both the design and operational aspects of healthcare infrastructure.

Years of Experience: In terms of industry experience, 40 respondents (36.0%) had between 5–10 years, while 27 respondents (24.3%) had 11–15 years of experience, and 23 respondents (20.7%) had over 15 years of experience. A smaller group, 21 respondents (18.9%), had less than 5 years of experience. This blend of experience levels provides a comprehensive view of both emerging and seasoned professionals' perceptions.

Work Location: The geographical distribution shows that most respondents are based in Lagos (36.9%), Abuja (30.6%), and Port Harcourt (19.8%), which are Nigeria's key urban centers for construction and healthcare development. The remaining 12.6% are from other parts of the country, ensuring some level of regional representation.

Table 4.1 ***Demographic Information of Respondents***

Variable	**Category**	**Frequency**	**Percentage (%)**
Gender	Male	74	66.7
	Female	37	33.3
Age	Under 25	13	11.7
	26–35	42	37.8
	36–45	36	32.4
	Above 45	20	18.0
Profession	Architect	16	14.4
	Quantity Surveyor	34	30.6
	Engineer	28	25.2
	Facility Manager	12	10.8
	Hospital Administrator	11	9.9
	Others	10	9.0
Years of Experience	< 5 years	21	18.9
	5–10 years	40	36.0
	11–15 years	27	24.3
	> 15 years	23	20.7
Work Location	Lagos	41	36.9

Variable	Category	Frequency	Percentage (%)
	Abuja	34	30.6
	Port Harcourt	22	19.8
	Others	14	12.6

4.3 Current State of Sustainable Building Practices

4.3.1 Familiarity with Sustainable Building Services

This section examines the respondents' familiarity with the concept of sustainable building services in the context of healthcare facility construction. Out of the 111 valid responses, a significant majority, 94 respondents (84.7%), indicated that they are familiar with sustainable building services. Conversely, 17 respondents (15.3%) reported a lack of familiarity. This result suggests a high level of awareness among professionals regarding sustainability principles and their application in the construction of healthcare facilities. Such awareness is crucial in promoting the adoption and implementation of green building technologies in the Nigerian healthcare sector.

The responses were further ranked using the Relative Importance Index (RII) to understand the strength of opinions. The RII was calculated using the formula:

RII=ΣWA×N\text{RII} = \frac{\Sigma W}{A \times N}RII=A×NΣW

Where:

- ΣW\Sigma WΣW = sum of weights assigned by respondents (Yes = 2, No = 1)
- AAA = highest weight (2)
- NNN = total number of respondents (111)

Table 4.2: Familiarity with Sustainable Building Services

Response	Frequency	Percentage (%)	Rank	RII
Yes	94	84.7	1st	0.93
No	17	15.3	2nd	0.77

4.3.2 Practices Implemented in Projects (Multiple Responses Allowed):

This section identifies the sustainable building practices currently implemented in healthcare facility construction projects in Nigeria. Respondents were allowed to select multiple practices they have adopted or observed. The data reveal that solar energy systems are the most widely implemented practice, reported by 72 respondents (64.9%), followed closely by energy-efficient HVAC systems (61.3%), and waste management systems (54.1%).

Other practices such as natural ventilation (52.3%), rainwater harvesting (48.6%), sustainable materials (45.9%), and low-flow plumbing fixtures (42.3%) also featured prominently, though at slightly lower rates. These results indicate growing but uneven awareness and application of various sustainability measures in the Nigerian healthcare construction sector.

To determine the relative significance of each practice, the Relative Importance Index (RII) was calculated. Each affirmative response was assigned a score of 1, and RII was computed as:

RII=ΣWA×N\text{RII} = \frac{\Sigma W}{A \times N}RII=A×NΣW

Where:

- ΣW\Sigma WΣW = number of respondents selecting each item
- A=1A = 1A=1 (since it's binary – selected or not selected)
- N=111N = 111N=111 (total number of respondents)

Table 4.3. Practices Implemented in Healthcare Projects

Practice	Frequency	Percentage (%)	RII	Rank
Solar energy systems	72	64.9	0.65	1st
Energy-efficient HVAC systems	68	61.3	0.61	2nd
Waste management systems	60	54.1	0.54	3rd
Natural ventilation systems	58	52.3	0.52	4th
Rainwater harvesting	54	48.6	0.49	5th
Sustainable/eco-friendly materials	51	45.9	0.46	6th
Low-flow plumbing fixtures	47	42.3	0.42	7th

4.3.3 Rating of Current Level of Adoption:

This section assesses respondents' perception of the extent to which sustainable building services have been adopted in healthcare facility construction across Nigeria. The responses reveal that the adoption level is generally perceived to be moderate, as indicated by 44 respondents (39.6%), followed by low (32.4%) and high (15.3%). Only a small proportion of respondents rated the adoption level as very high (3.6%), while 9.0% believed it to be very low.

To further interpret the data, the Relative Importance Index (RII) was calculated for each rating. The following scoring scale was applied:

- Very High = 5
- High = 4
- Moderate = 3
- Low = 2
- Very Low = 1

The RII was computed using the formula:

RII=ΣWA×N\text{RII} = \frac{\Sigma W}{A \times N}RII=A×NΣW

Where:

- ΣW\Sigma WΣW = sum of weighted scores
- A=5A = 5A=5 (highest weight)
- N=111N = 111N=111 (number of respondents)

ΣW=(5×4)+(4×17)+(3×44)+(2×36)+(1×10)=20+68+132+72+10=302\Sigma W = (5×4) + (4×17) + (3×44) + (2×36) + (1×10) = 20 + 68 + 132 + 72 + 10 = 302 ΣW=(5×4)+(4×17)+(3×44)+(2×36)+(1×10)=20+68+132+72+10=302
RII=3025×111=302555≈0.544\text{RII} = \frac{302}{5 \times 111} = \frac{302}{555} ≈ 0.544RII=5×111302=555302≈0.544

Table 4.4 Rating of Current Level of Adoption of Sustainable Practices

Rating	Frequency	Percentage (%)	Weighted Score	RII	Rank
Moderate	44	39.6	132	0.544	1st
Low	36	32.4	72	0.486	2nd
High	17	15.3	68	0.442	3rd
Very Low	10	9.0	10	0.180	4th
Very High	4	3.6	20	0.090	5th

These results indicate that the majority of professionals perceive the adoption of sustainable practices in healthcare construction as moderate to low, suggesting a need for stronger policy enforcement, financial incentives, and awareness to enhance adoption levels.

4.4 Impact of Sustainable Building Services

This section evaluates respondents' perceptions of the impact of sustainable building services on critical performance areas in healthcare facilities, including energy cost reduction, patient comfort,

environmental protection, operational efficiency, and workers' productivity. The results reflect a generally positive perception of sustainability's benefits in healthcare construction.

Energy Cost Reduction: A combined **72.9%** of respondents (41 = 36.9% *very high*, and 40 = 36.0% *high*) strongly believe that sustainable building services significantly reduce energy costs in healthcare facilities. This aligns with global best practices where energy-efficient systems help lower operational expenditures.

Patient Comfort and Recovery: Approximately 72.9% of respondents also rated the impact of sustainability on patient comfort and recovery as either very high or high. Natural lighting, improved indoor air quality, and thermal regulation are likely contributing to these perceptions.

Environmental Protection: This area received the highest positive perception, with **77.4%** of respondents (46 = 41.4% *very high*, and 40 = 36.0% *high*) acknowledging that sustainable practices contribute significantly to environmental protection. This reflects growing awareness of climate change and the ecological footprint of healthcare construction.

Operational Efficiency: About **72.9%** of respondents agreed that operational efficiency improves with the integration of sustainable systems. Efficient water use, power management, and waste handling contribute to smoother operations.

Healthcare Workers' Productivity: **70.2%** of respondents (36 = 32.4% *very high*, and 42 = 37.8% *high*) acknowledged that sustainable features enhance workers' productivity, possibly due to improved indoor environments, comfort, and safety.

Table 4.5: Perceived Impact of Sustainable Building Services

Area	Very High (%)	High (%)	Moderate (%)	Low (%)	None (%)	Positive Impact (%)
Energy cost reduction	36.9	36.0	18.0	6.3	2.7	**72.9**
Patient comfort and recovery	34.2	38.7	17.1	6.3	3.6	**72.9**
Environmental protection	41.4	36.0	14.4	5.4	2.7	**77.4**
Operational efficiency	37.8	35.1	18.0	6.3	2.7	**72.9**
Workers' productivity	32.4	37.8	19.8	6.3	3.6	**70.2**

4.5 Observable Benefits of Sustainable Building Services

This section explores whether respondents have observed tangible benefits from the implementation of sustainable building services in healthcare facility construction. The findings reveal a strong consensus on the positive outcomes associated with sustainability practices.

Out of the 111 valid responses, a large majority—91 respondents (82.0%)—affirmed that they have observed clear and measurable benefits from the application of sustainable building services in their projects. These benefits likely include reductions in operational costs, enhanced environmental performance, improved patient comfort, and more efficient use of energy and resources.

In contrast, 9 respondents (8.1%) reported that they have not observed any benefits, possibly due to limited implementation, lack of follow-up evaluation, or misapplication of sustainability principles. Meanwhile, 11 respondents (9.9%) were uncertain about whether sustainable features had produced any observable results, which may reflect a gap in monitoring and impact assessment.

These findings suggest that sustainable practices are not only known but are also delivering practical results in real-world applications, reinforcing the need to promote their broader adoption across the Nigerian healthcare construction sector.

Table 4.6: Observable Benefits of Sustainable Building Services

Response	Frequency	Percentage (%)	Rank
Yes	**91**	**82.0**	**1st**
Not Sure	**11**	**9.9**	**2nd**
No	**9**	**8.1**	**3rd**

The overwhelmingly positive response highlights the effectiveness of sustainable building practices and their increasing recognition among construction and healthcare professionals in Nigeria.

4.6 Challenges to Implementation of Sustainable Building Services

This section identifies the major barriers affecting the effective implementation of sustainable building services in healthcare facility construction across Nigeria. Respondents were allowed to select multiple options to reflect the multifaceted nature of these challenges.

The most significant barrier, as identified by 79 respondents (71.2%), is the high cost of implementation. This reflects the widespread perception that sustainable technologies and eco-friendly materials require substantial upfront investment, which may be unaffordable for many healthcare developers, especially in the public sector.

Lack of awareness and knowledge was the second most cited challenge, selected by 68 respondents (61.3%). This indicates a critical need for training, education, and sensitization on the long-term benefits and practicality of sustainable construction.

Closely following is inadequate government support or policies, reported by 66 respondents (59.5%). This highlights a major systemic issue where the absence of enabling frameworks, financial incentives, and regulatory enforcement discourages the adoption of green building practices.

Lack of skilled professionals (55.9%), poor infrastructure (45.9%), and resistance to change (42.3%) were also noted as key obstacles. These issues point to broader institutional and technical deficiencies within Nigeria's construction and healthcare sectors, where even if the will exists, the means to execute sustainable practices may be lacking.

These findings suggest that the challenges are not merely technical or financial, but also educational, institutional, and cultural—requiring a holistic, multi-stakeholder intervention to overcome.

Table 4.6: Major Challenges to Implementation of Sustainable Building Services

Barrier	Frequency	Percentage (%)	Rank
High cost of implementation	79	71.2	1st
Lack of awareness/knowledge	68	61.3	2nd
Inadequate government support/policies	66	59.5	3rd
Lack of skilled professionals	62	55.9	4th
Poor infrastructure	51	45.9	5th
Resistance to change	47	42.3	6th

These ranked barriers highlight priority areas for intervention, such as reducing costs through incentives, improving technical capacity, and strengthening policy and advocacy efforts for green healthcare infrastructure in Nigeria.

4.7 Agreement on Policy and Regulation Hindrance:

This section examines the extent to which respondents believe that inadequate policy frameworks and weak regulatory enforcement hinder the adoption of sustainable building services in healthcare facility construction in Nigeria.

The results show that a substantial majority 48 respondents (43.2%) strongly agree and 39 respondents (35.1%) agree that poor government policies and weak enforcement mechanisms significantly obstruct sustainability efforts. This brings the total percentage of agreement to 78.3%, reflecting a strong consensus on the role of policy in either enabling or restricting sustainable construction.

Meanwhile, 14 respondents (12.6%) remained neutral, indicating uncertainty or lack of awareness of policy-related influences. Only 7 respondents (6.3%) disagreed and 3 respondents (2.7%) strongly disagreed, suggesting that only a minority believe policy issues are not a major barrier.

This result emphasizes the critical need for policy reform and strategic government intervention, including the creation of clear, enforceable green building codes, financial incentives, and a national sustainability roadmap specifically tailored to healthcare infrastructure development.

Table 4.7 Respondents' Agreement on Policy and Regulation Hindrance

Response	Frequency	Percentage (%)	Rank
Strongly Agree	48	43.2	1st
Agree	39	35.1	2nd
Neutral	14	12.6	3rd
Disagree	7	6.3	4th
Strongly Disagree	3	2.7	5th

The data clearly affirms that policy gaps are among the most significant impediments to the widespread adoption of sustainable building services in Nigeria's healthcare construction sector. Tackling this issue will require legislative backing, stakeholder engagement, and increased political will.

4.8 Recommendations for Improvement

This section presents respondents' suggested strategies to enhance the adoption and implementation of sustainable building services in healthcare facility construction across Nigeria. Respondents were allowed to select multiple strategies, reflecting the multidimensional nature of the issue.

The most highly recommended strategy was the provision of government incentives and subsidies, identified by 82 respondents (73.9%). This suggests that financial support in the form of tax relief, grants, or subsidies is seen as a crucial catalyst for encouraging sustainability in healthcare construction, especially given the high initial cost of implementation.

Closely following was professional training and capacity building, with 77 respondents (69.4%) emphasizing the need to upskill professionals involved in design, construction, and facility management. This highlights the importance of equipping the workforce with the technical knowledge and competencies required for sustainable practices.

Public awareness campaigns were selected by 74 respondents (66.7%), reflecting the need for grassroots education and advocacy to promote the long-term benefits of green building practices among both stakeholders and the general public.

Mandatory green building codes, supported by 70 respondents (63.1%), were also viewed as essential for institutionalizing sustainability practices through enforceable regulations.

Lastly, public-private partnerships (PPP) were identified by 68 respondents (61.3%) as a viable approach to drive innovation and financing through collaborative efforts between government agencies and private sector stakeholders.

These findings suggest that the successful implementation of sustainable practices in Nigerian healthcare construction depends on a combination of policy reform, financial incentives, capacity development, regulation, and multi-stakeholder collaboration.

Table 4.8: Recommended Strategies for Enhancing Sustainable Building Services

Strategy	**Frequency**	**Percentage (%)**	**Rank**
Government incentives/subsidies	82	73.9	1st
Professional training/capacity building	77	69.4	2nd
Public awareness campaigns	74	66.7	3rd
Mandatory green building codes	70	63.1	4th
Public-private partnerships	68	61.3	5th

In summary, these recommendations emphasize the urgent need for systemic changes, not only through regulatory actions and public sensitization but also through sustainable financing and skills development to ensure widespread and lasting adoption of green building services in the Nigerian healthcare sector.

4.9 Summary of Key Findings

The analysis of data gathered from 111 valid responses offers a clear view of the current landscape, challenges, and opportunities surrounding the implementation of sustainable building services in healthcare facility construction in Nigeria. The following key findings were identified:

Widespread Awareness and Implementation of Sustainable Practices:
The majority of respondents (84.7%) demonstrated a high level of familiarity with sustainable building services. A significant number reported practical implementation of various sustainability measures, particularly solar energy systems (64.9%), energy-efficient HVAC systems (61.3%), and natural ventilation (52.3%). This indicates that sustainable practices are not only known but are also being incorporated into healthcare construction projects, reflecting a gradual shift towards greener infrastructure in the sector.

Recognized Positive Impacts on Operational and Environmental Performance:
Respondents overwhelmingly acknowledged the positive impacts of sustainable building services on key performance indicators such as energy cost reduction (72.9%), patient comfort and recovery (72.9%), environmental protection (77.4%), and operational efficiency (72.9%). These perceptions support existing literature that links sustainability to long-term cost savings, improved indoor environmental quality, and enhanced service delivery in healthcare settings.

Existence of Significant Barriers to Widespread Adoption:
Despite the recognized benefits, the study identified major obstacles limiting the full integration of sustainable practices. Chief among these is the high cost of implementation (71.2%), followed by lack of awareness or knowledge (61.3%), inadequate government support or policies (59.5%), and shortages of skilled professionals (55.9%). These barriers are indicative of broader systemic and institutional weaknesses that must be addressed to scale up sustainable construction nationwide.

Strong Perception of Policy and Regulatory Hindrance:
A combined 78.3% of respondents either strongly agreed or agreed that weak regulatory frameworks and lack of enforceable policies are hindering the adoption of sustainable building services. This underlines the urgent need for government-led initiatives, including the formulation

and enforcement of green building codes, provision of financial incentives, and establishment of regulatory standards tailored specifically to healthcare facilities.

Consensus on Strategic Recommendations for Improvement:
There was strong support for targeted interventions to boost sustainability uptake. The most recommended strategies were government incentives/subsidies (73.9%), professional training and capacity building (69.4%), and public awareness campaigns (66.7%). These, along with mandatory regulations and public-private partnerships, form a robust roadmap for advancing sustainable construction in the healthcare sector.

In summary, while there is a promising level of awareness and gradual implementation of sustainable building services in Nigeria's healthcare construction industry, systemic challenges related to cost, policy, capacity, and regulation remain critical bottlenecks. However, with strong stakeholder collaboration and targeted government support, these challenges can be addressed to unlock the full potential of sustainability in enhancing healthcare infrastructure performance

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Summary of the Study

This research was conducted to critically analyze the role of sustainable building services in healthcare facility construction in Nigeria. The growing concerns about climate change, resource depletion, and rising healthcare operational costs have made the integration of sustainable practices into healthcare infrastructure a necessity. The study aimed to assess the current state of sustainable building practices, evaluate their impact on healthcare operations, identify implementation challenges, and propose practical strategies for improvement.

A structured questionnaire was administered to construction and healthcare professionals across key Nigerian cities. A total of 120 questionnaires were distributed, with 111 valid responses retrieved and analyzed. The findings reveal significant awareness of sustainable building services among professionals, with a moderate level of practical implementation, particularly in areas like solar energy, energy-efficient HVAC systems, and natural ventilation.

Respondents confirmed the positive impacts of sustainability measures on energy savings, operational efficiency, patient recovery, and environmental protection. However, the study identified cost of implementation, limited technical capacity, poor policy support, and infrastructural challenges as key barriers to widespread adoption. There was also strong consensus on the need for policy reforms, financial incentives, capacity building, and increased public-private collaboration to promote sustainable practices.

5.2 Conclusion

Based on the findings, the study concludes that sustainable building services have a significant and positive impact on healthcare facility construction in Nigeria. These services improve building performance, reduce operational costs, and enhance patient and staff wellbeing. However, their implementation remains suboptimal due to various technical, financial, and institutional constraints.

The research affirms that sustainability in healthcare construction is not just desirable, but essential for achieving long-term efficiency, environmental protection, and improved service delivery in Nigeria's healthcare system. Overcoming existing barriers will require a coordinated effort involving government, private sector, professionals, and community stakeholders.

5.3 Recommendations

In light of the study's findings and conclusion, the following recommendations are made to enhance the adoption and effectiveness of sustainable building services in healthcare construction projects:

Provision of Government Incentives and Financial Support: The high cost of sustainable technologies can be mitigated through targeted subsidies, tax rebates, green loans, and grants to healthcare providers and developers who adopt sustainable building solutions.

Formulation and Enforcement of Green Building Regulations: The Nigerian government should develop and enforce mandatory green building codes tailored to healthcare infrastructure. These codes should include minimum sustainability benchmarks and compliance mechanisms.

Capacity Building and Professional Training: Regular workshops, seminars, and certification programs should be organized to equip architects, engineers, quantity surveyors, and facility managers with knowledge and skills in sustainable design and construction.

Awareness and Sensitization Campaigns: Government agencies, NGOs, and professional bodies should carry out nationwide awareness campaigns to educate healthcare administrators, policymakers, and the general public on the long-term benefits of sustainable healthcare infrastructure.

Encouraging Public-Private Partnerships (PPPs): Collaboration between government and the private sector can mobilize funding, technical expertise, and innovation required for large-scale sustainable healthcare projects.

Inclusion of Sustainability in Project Procurement Criteria: Sustainability metrics should be embedded in healthcare project planning, bidding, and procurement processes to ensure contractors and designers prioritize environmentally responsible solutions.

Development of Local Technologies and Materials: Promoting research and development of affordable, eco-friendly local building materials can reduce costs and support the local economy while enhancing sustainability.

5.4 Suggestions for Further Research

While this study has contributed valuable insights into sustainable building services in Nigerian healthcare construction, further research is recommended in the following areas:

A comparative study of sustainable practices between public and private healthcare facilities in Nigeria.

An assessment of post-occupancy performance of sustainable healthcare buildings in terms of energy usage and user satisfaction.

A cost-benefit analysis of sustainable versus conventional healthcare construction in different Nigerian regions.

Investigation into the use of digital tools, such as Building Information Modelling (BIM) and IoT, for managing sustainability in healthcare infrastructure.

APPENDIX

QUESTIONNAIRE

Department of Quantity Surveying,
Institute of Environmental Studies
Kwara state Polytechnic, Ilorin.
Kwara State.

Dear Sir/Madam,

RESEARCH QUESTIONNAIRE: Critical Analysis of Sustainable Building Services and Their Impact on Healthcare Facility Construction in Nigeria

I Ibraheem Abduljelil Olarewaju, an undergraduate student of Quantity Surveying Department, at the Kwara state polytechnic, Ilorin, I am undertaking my final year research thesis in partial fulfilment of the requirement for the award of Higher National diploma.

While appreciating your busy schedule, with all due respect I humbly solicit that your spare time to help respond to the attached questionnaire which is crucial to the success of my on-going research titled above.

Your response will be treated with confidentiality and used only for the purpose of this research work.

Thank you for your anticipated cooperation

Yours sincerely

IBRAHEEM ABDULJELIL OLAREWAJU

HND/23/QTS/FT/0038

Investorgold46@gmail.com
08102354089

Section A: Demographic Information

1. Gender:
   ☐ Male ☐ Female
2. Age:
   ☐ Under 25 ☐ 26–35 ☐ 36–45 ☐ Above 45
3. Profession:
   ☐ Architect ☐ Quantity Surveyor ☐ Engineer ☐ Facility Manager ☐ Hospital Administrator ☐ Other (Please specify): _____
4. Years of Experience in the Construction or Healthcare Industry:
   ☐ Less than 5 years ☐ 5–10 years ☐ 11–15 years ☐ Above 15 years
5. Location of Work:
   ☐ Lagos ☐ Abuja ☐ Port Harcourt ☐ Other (Please specify): _____

Section B: Current State of Sustainable Building Practices

6. Are you familiar with the concept of sustainable building services?
   ☐ Yes ☐ No
7. Which of the following sustainable practices have been implemented in your healthcare facility/projects? (Tick all that apply)
   ☐ Solar energy systems
   ☐ Energy-efficient HVAC systems
   ☐ Rainwater harvesting
   ☐ Low-flow plumbing fixtures
   ☐ Recycling and waste management systems
   ☐ Natural ventilation systems
   ☐ Use of sustainable/eco-friendly materials
8. How would you rate the current level of sustainable building practices in healthcare construction in Nigeria?
   ☐ Very High ☐ High ☐ Moderate ☐ Low ☐ Very Low

Section C: Impact of Sustainable Building Services

9. In your opinion, how significant is the impact of sustainable building services on the following?

Area	Very High	High	Moderate	Low	None
Energy cost reduction	☐	☐	☐	☐	☐
Patient comfort and recovery	☐	☐	☐	☐	☐
Environmental protection	☐	☐	☐	☐	☐
Operational efficiency	☐	☐	☐	☐	☐
Healthcare workers' productivity	☐	☐	☐	☐	☐

10. Are there observable benefits in projects where sustainable services were applied?
    ☐ Yes ☐ No ☐ Not Sure

If yes, please briefly describe: _____

Section D: Challenges in Implementation

11. What are the major barriers to adopting sustainable building services in Nigerian healthcare facilities? (Tick all that apply)
    ☐ High cost of implementation
    ☐ Lack of awareness/knowledge
    ☐ Inadequate government support or policies
    ☐ Lack of skilled professionals
    ☐ Resistance to change
    ☐ Poor infrastructure

12. To what extent do you agree that inadequate policy and regulatory enforcement hinder sustainability adoption?
    ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

Section E: Recommendations

13. What strategies do you recommend for improving sustainable building service adoption in Nigeria's healthcare facilities? (Tick all that apply)
    ☐ Government incentives/subsidies
    ☐ Public awareness and sensitization
    ☐ Mandatory green building codes

☐ Professional training and capacity building

☐ Public-private partnerships

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