



## Evaluation of Cost Factors Influencing the Adoption of Sustainable Construction Practices in Abuja, Nigeria

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### Abstract

The adoption of sustainable construction practices is crucial in addressing environmental, economic and social concerns in the built environment. However, cost-related factors remain a significant barrier to their widespread implementation, particularly in developing countries like Nigeria. This paper, therefore, seeks to assess the cost factors influencing the adoption of sustainable construction practices in Abuja, Nigeria, with a view to improve cost efficiency. A quantitative research approach was adopted using self-administered questionnaires to collect data from experienced construction professionals registered with the Green Building Council of Nigeria (GBCN). A mixture of purposive and snowball sampling techniques was employed to select professionals with requisite experience and involvement in sustainable construction practice. Data collection was done using a questionnaire survey via self-administered questionnaires to experienced professionals. Data was analyzed using descriptive statistics, which is the relative importance index (RII), to rank the significance of various cost factors. The study revealed that the most significant cost factors include high initial capital costs, the expensive nature of sustainable materials, and limited financial incentives. Other critical cost factors identified include the cost of renewable energy systems, maintenance and operational expenses, poor knowledge of life-cycle costing, project financing challenges, and regulatory compliance costs. Despite these challenges, the study underscores the long-term economic benefits of sustainability through reduced operational costs and increased property value. To promote sustainable construction, the study recommends the development of financial support frameworks, such as grants and low-interest loans, increased availability of local sustainable materials and enhanced education on life-cycle costing to improve awareness through education and training. Addressing these cost factors is essential for fostering a more sustainable and cost-effective construction industry in Abuja, Nigeria.

**Keywords:** Cost factors, Financial incentives, Initial capital cost, Sustainable construction, Life-cycle cost.

### 1.0 Introduction

The construction industry plays a vital role in the economy of both developing and developed nations. The Nigerian construction industry (NCI) has significant impact on the GDP of the country as well as on the immediate environment in which its product (construction project) is to be or are currently situated. In addition, it affects the social well-being of the local population as well as the technical aspects of the projects that are built and the surrounding environment [38]. Construction activities inevitably have both positive and negative effects on the economy, society and environment. However, the nation's economy and social growth have benefited greatly from the Nigeria construction industry (NCI). A growing idea in the construction industry is sustainable construction, which attempts to apply sustainability basic principles to present building practices [10]. Over the years, the construction industry has been recognized as one of the major contributors to the economic development of a country owing to its ability to create employment, wealth, and infrastructure [36].

Sustainability is the ability to satisfy current needs without jeopardizing the ability of future generation to meet their own needs in line with economic, social and environmental dimensions [39]. Sustainability in the construction industry is essential, focusing on balancing the built and natural environments to foster communities that promotes human dignity and economic fairness [39]. According to [37], waste minimization, environmental protection, and resource efficiency are the three-primary focus of sustainable construction practices. Additionally, [22] advocates for sustainable construction practices, including optimizing site potentials, minimizing energy use, utilizing renewable energy, conserving water, using environmentally friendly products, and improving indoor environmental quality. This paper seeks to address cost factors influencing the adoption of sustainable construction practice in Abuja, Nigeria with a view to improve cost efficiency, promote wider adoption of sustainable methods and enhancing overall project affordability.

### 1.1 Literature Review

### 1.2 Concept of Sustainability

Sustainability is not instinctively understood and well-communicated [37]. According to [57], the concept of sustainability is grounded in the principle of fostering socioeconomic development within the limits of ecological systems, emphasizing the equitable redistribution of resources to enhance the quality of life for all and the concept

of future generations possibility of long-term usage of resources to ensure the necessary quality of life for future generations. The perception of sustainability is that it only concerns environmental protection in the current body of knowledge. However, other elements of sustainability, such as economic and social, cannot be ignored and therefore, the concept of sustainability should be considered as a holistic and integrative approach in order to keep a balance between the three elements [58] Achieving sustainability in Nigeria is to establish an economy that is viable, environmentally sound and socially responsible [34].

Thus, on a general note, sustainability is a broad and multifaceted concept that encompasses principles and practices aimed at fulfilling the requirements of the current generation while preserving the capacity of future generations to satisfy their own needs [18]. It involves balancing environmental, social and economic considerations to ensure that human activities are conducted in a way that preserves natural resources, promotes social equity and supports economic prosperity over the long term. The notion of sustainability integrates multiple domains of existence to attain equilibrium among the economic, social and environmental facets of human endeavors [68].

It recognizes the interconnectedness of environmental, social and economic systems and seeks to address the complex challenges facing humanity in a holistic and integrated manner. It acknowledges that decisions and actions taken in one aspect of sustainability can have cascading effects on others, emphasizing the importance of integrated approaches and systemic thinking.

### 1.3 Cost Factors Influencing the Adoption of Sustainable Construction Practices

Cost is frequently identified as a significant constraints to the adoption of sustainable development practices in construction projects [16]. Cost is recognized as one of the most crucial impediments to the implementation of sustainable construction practice in China, Hong Kong, Singapore, United States and Malaysia [12, 13, 15, 21, 50, 67].

The adoption of sustainable construction practices has faced several cost-related barriers, which have hindered its widespread implementation. One of the primary obstacles is the perception of higher initial investment costs associated with green building projects [32, 59]. This perception of higher upfront costs is a significant deterrent for potential customers, as they often prioritize the initial project budget over the long-term operational and maintenance savings [32]. [16] further stated that the misconception of high capital cost has been regarded as a key factor affecting the demand for sustainable construction projects in the market. [43], pointed out that the key drivers influencing the adoption of sustainable construction in Nigeria are financial incentives, capital investment considerations, government's support, heightened awareness, the establishment of labeling standards, and a sustainable housing policy.

The concept of cost factors in sustainable construction refers to the financial considerations associated with implementing sustainable practices and strategies in construction projects. However, sustainable construction offers numerous environmental, social and economic benefits, it often involves upfront costs that can be perceived as higher compared to conventional construction methods. [13, 60] revealed that the projected cost of a sustainable construction is between 1% and 25% higher than that of a conventional building. Design layout complexity, modeling, and green practices all contribute to the greater cost [63]. The use of sustainable building materials cost 3–4% more than using traditional building materials [64, 65]. The exorbitant expenses of sustainable building affect the project management team since they will be accountable for dealing with and handing over their initiatives within a pre-set budget.

[17], revealed the concerns about unexpected expenses and the fear of higher investment costs for sustainable buildings in comparison to standard buildings are frequently cited as obstacles for sustainable buildings. The adoption of sustainable building solutions may be hindered because clients are concerned about the higher risk based on unfamiliar techniques, the lack of previous experience, additional testing and inspection in construction, a lack of manufacturer and supplier support, and a lack of performance information [5].

Adopting sustainable construction practices could help the construction industry achieve sustainable national development by lowering the environmental impact of a built asset across its entire lifecycle [20, 44]. This adoption of sustainable construction practices can have significant impact on cost implications, both upfront and over the life cycle of a project. However, some sustainable practices may result in higher initial costs, they often provide long-term economic benefits through reduced operational costs, increased asset value and improved productivity. Initial construction cost influences the adoption of sustainable construction practices due to its significant impact on a project's overall budget [61]. According to [13] revealed that sustainable construction generally incurs higher upfront costs compared to conventional building practices, attribute to the use of eco-friendly materials, energy-efficient systems, and sustainable design approaches. Studies by [17] pointed out that sustainable materials such as recycled steel and low-emission concrete typically cost more, and in countries like Nigeria, limited local availability often results in higher prices due to import and logistics costs.

Despite the high initial costs, sustainable construction can offer substantial long-term savings, reduced energy consumption, lower maintenance expenses and increased property value often offset the upfront financial burden,

making sustainability economically viable over the building's life-cycle [12, 24]. To manage these high initial costs and encourage broader adoption, effective cost forecasting and government incentives are essential, bridging the gap for developers and promoting the long-term benefits of sustainable construction [59].

### 1.3.1 Financial incentives

According to [11] sustainable construction projects often require financial incentives and government subsidies to offset the higher initial costs. In Nigeria, there are limited financing incentives specifically tailored for green construction [52]. This lack of financial support acts as a barrier to widespread adoption. Securing financing for sustainable construction projects can be difficult due to the higher initial costs and longer return periods, leading to higher interest rates or equity costs [62].

### 1.3.2 Design and planning costs

Integrated design process incorporating sustainable design principles from the early planning stages may require additional time and resources from architects, engineers and consultants, increasing design costs and site analysis conducting thorough site assessments to evaluate factors like solar orientation, wind patterns, and local climate can add to the initial planning costs [9]. Life cycle costing (LCC) takes into account the possible upfront and ongoing expenses over a predetermined time frame in order to assess the cost-effectiveness of alternative design approaches [51]. Conducting a comprehensive life cycle cost analyses to evaluate the long-term economic benefits of sustainable strategies may require additional resources and expertise.

### 1.3.3 Higher cost of sustainable materials

Studies by [40] stated that Eco-friendly materials, such as recycled concrete, low-carbon steel, and sustainably sourced timber, are often more expensive than conventional building materials. Additionally, these materials may not be locally available in Nigeria, which leads to high import costs. Similarly, [25] added that sustainable materials such as bamboo, recycled steel, and non-toxic insulation tend to be more expensive compared to traditional materials.

### 1.3.4 Certification and documentation costs

High cost of certifications acts as a barrier to the widespread adoption of sustainable practice [7]. Studies by [6] pointed out that Obtaining certification for green buildings can be expensive. This certification process involves significant costs for documentation, auditing and compliance verification. For developers seeking to gain recognition for their sustainable practices, the costs of obtaining these certifications can be prohibitive, particularly for small to medium-sized construction firms in Nigeria. As a result, many developers are deterred from pursuing such certifications, even when they implement sustainable practices. Pursuing certifications like LEED, BREEAM, or Green Globes involves registration fees, documentation costs, and third-party verification expenses [47].

### 1.3.5 Operational and maintenance costs

Sustainable buildings often come with lower operational costs in the long term, particularly in terms of energy and water savings [56]. However, the maintenance of advanced technologies such as solar energy systems, water recycling units, and energy-efficient HVAC systems can involve specialized skills and resources that increase overall costs. Moreover, these systems reduce operational expenses in the long run, the higher maintenance costs and the need for specialized professionals to manage these systems can offset some of the financial benefits of sustainability, particularly in the early years of a project [41]. Studies by [26] reveals that sustainable practices often result in significant long-term savings through reduced energy and water consumption. Strategies like waste minimization and material reuse can lower operational costs related to waste disposal and resource procurement. Improving indoor environmental quality, enhance ventilation, natural lighting, and better indoor air quality can lead to increased occupant productivity and reduced absenteeism, offsetting potential higher operational costs [28].

### 1.3.6 Poor knowledge of life-cycle costing

Poor knowledge of life-cycle costing (LCC) is a major factor implementing sustainable construction practices [30]. Life-cycle costing is an approach that assesses the total cost of ownership, encompassing initial costs, operational expenses, maintenance, and disposal or recycling costs, offering a complete financial picture of a project over its useful life. Studies from [19] indicate that a lack of knowledge in LCC results in misconceptions about the financial viability of sustainable projects. [17] revealed that many professionals do not incorporate LCC because they lack the tools or methodologies to estimate these costs accurately, resulting in a preference for conventional methods that appear cheaper initially but are costlier over time.

However, poor knowledge of life-cycle costing contributes to difficulty in justifying sustainable investments to clients, especially when sustainability premiums are involved [31]. [49] argue that LCC knowledge gaps prevent

clients from seeing the long-term economic benefits, such as reduced utility costs, lower maintenance expenses, and potential increases in property value. To address this, there is a need for increased training and education on LCC principles, as well as the development of user-friendly tools that make it easier to conduct LCC analyses. Enhancing LCC knowledge among construction professionals can help stakeholders better understand the economic rationale for sustainable practices, ultimately promoting greater adoption of these practices across the industry [4].

### **1.3.7 Cost of skilled labour and expertise**

The cost of skilled labor and expertise is a critical factor impacting the adoption of sustainable construction practices [20]. Sustainable construction often requires specialized skills in green building technologies, energy-efficient design, eco-friendly material selection, and sustainable project management [27]. According to [23], one of the primary challenges in sustainable construction is the shortage of workers trained in green building methods, which increases labor costs as demand for these specialized skills outpaces supply.

However, the cost of skilled labor and expertise remains a significant factor in sustainable construction, influencing both initial project costs and long-term sustainability goals [42]. Improving the availability and affordability of skilled labor through training initiatives, the construction industry can enhance the feasibility of sustainable practices, promoting broader adoption across projects and sectors.

### **1.3.8 Long payback periods**

Long payback periods in sustainable construction deter adoption as the initial high costs for eco-friendly materials and energy-efficient systems may take years to recoup. This delay in financial return can discourage investment, especially for stakeholders prioritizing short-term gains [2].

### **1.3.9 Limited availability of sustainable technologies**

The limited availability of sustainable technologies is a critical cost factor in adopting sustainable construction practices. Due to the emerging nature of green technology, materials and systems like solar panels, energy-efficient HVAC, and eco-friendly insulation may be harder to source or limited to specific suppliers [3]. Studies from [53] revealed that this scarcity can drive up costs, as procurement may involve importing items or sourcing from distant locations, leading to higher transportation expenses and delays. Additionally, studies by [1] revealed that limited availability may reduce competitive pricing, making it challenging for developers to implement these technologies affordably, ultimately impacting project budgets and timelines.

### **1.3.10 Cost of renewable energy system**

Implementing systems like solar panels, wind turbines or geothermal heating demands a considerable initial outlay. This includes expenses for specialized equipment, skilled labor, and sometimes building modifications to accommodate the technology, all of which add to the project's cost [54]. Although energy systems can lower utility bills over time, their high upfront expense can be a financial challenge for developers, especially for projects with limited budgets or shorter financial timelines. This cost factor can restrict the adoption of renewable energy systems, even with their long-term benefits for the environment and operational savings [45].

### **1.3.11 Regulatory and compliance cost**

Regulatory and compliance costs add financial burdens to sustainable construction projects, as meeting stringent environmental standards often requires additional investments in specialized materials, certifications, and audits to ensure compliance with sustainability regulations [35, 29]. These requirements can elevate initial project costs, impacting overall budget and feasibility for developers.

### **1.3.12 Cost of water management system**

Implementing water management systems in sustainable construction, such as rainwater harvesting, greywater recycling and low-flow fixtures, often incurs additional costs for specialized equipment, installation and maintenance [55]. These upfront expenses can increase project budgets, even though they lead to long-term water conservation and savings.

### **1.3.13 Lack of local sustainable material suppliers**

[48] revealed that lack of local suppliers for sustainable materials raises costs in sustainable construction due to added expenses for transporting materials from distant locations and potential project delays. This limited availability makes sustainable options less accessible and more expensive for developers.

### 1.3.14 Project financing and interest rates

Securing financing for sustainable construction projects can be challenging, as lenders may view the high initial costs and extended payback periods as risks, leading to higher interest rates [46]. These increased financing costs add to the overall project expense, making sustainable options less attractive. Additionally, limited green financing options can further restrict access to affordable capital for sustainable initiatives [33].

After the rigorous review of literature undertaken in this section, several cost factors influencing the adoption of sustainable construction practices have been identified. These cost factors are highlighted in Table 1.

Table 1: Cost Factors Influencing the Adoption of Sustainable Construction Practices

S/N	Cost Factors Influencing the Adoption of Sustainable Construction Practices	Source (s)
1	Initial Capital Cost	[13, 16, 32, 59, 60]
2	Limited Financial Incentives	[11, 52, 62]
3	Cost of Skilled Labour and Expertise	[20, 23, 27, 42]
4	High Cost of Sustainable Material	[25, 40]
5	Maintenance and Operational Costs	[26, 28, 41, 56]
6	Green Building Certification cost	[6, 7, 47]
7	Poor Knowledge of Lifecycle Costing	[4, 17, 19, 30, 31,49]
8	Long payback periods	[2]
9	Limited availability of Sustainable Technologies	[1, 3, 53]
10	Design and planning cost	[9, 51]
11	Cost of Renewable energy system	[45, 54]
12	Regulatory and Compliance cost	[29, 35]
13	Lack of local sustainable material suppliers	[48]
14	Cost of water management systems	[55]
15	Project Financing and Interest rates	[33, 46]

Source: Uthman and Sulaiman (2025)

## 2.0 Methodology

Research methodology provides a structured approach to investigate the cost factors influencing the adoption of sustainable construction practices in Abuja, Nigeria. This study employed quantitative survey research design approach, using structured questionnaires to extract information on cost factors influencing the adoption of sustainable construction practice in Abuja Nigeria. This study target population were professionals in construction firms in Abuja which were listed in Nigeria Directory Online website ([www.directory.org.ng](http://www.directory.org.ng)) that are registered with GBCN (Green Building Council of Nigeria). The list has 201 construction firms, out of which only 20 firms are in the category of "Construction & Renovation" were considered. Data collected through self-administered questionnaire. 50 questionnaires were administered, 47 were returned which represent 94% rate of returned and the all returned questionnaires were analyzed. The respondents were purposively selected based on their requisite knowledge, experience and their involvement in sustainable construction practice. This study adopted well-structured close-ended questionnaire which was divided into two parts. Part A Covers general information relating to the characteristics of respondents, and part B covers information on cost factors influencing the adoption of sustainable construction practices. Data collected through administered questionnaires was analyzed using descriptive statistic which is Relative Importance Index (RII). The RII values were determined using equation 2.

$$RII = \frac{\sum W}{N^*A} \quad (2)$$

In Equation 2, W is the weightage given to each factor by respondents which range from 1 to 5 using Likert's scale, N is the total number of respondents and A is the highest weight (5) which was aided by statistical software

package SPSS 16. The variables were ranked using decision rule ranging from point 0.00-0.20 least significant, 0.21-0.40 less significant, 0.41-0.60 significant, 0.61-0.80 very significant and 0.81-1.00 extremely significant.

### 3.0 Results and Discussion

#### 3.1 Demographic Information

Table 3.1 revealed that the largest contributors to the research were Quantity Surveyor 44.7%, followed by Architect 21.3%, and next are Engineer 19.2%, Project Manager 8.5% and finally Builders 6.4%. Table 3.1 described the highest educational level of the respondents. It was revealed that 44.7% have BTech/BSc., while 40.5% have MSc/MTech. Furthermore, 8.53% of the respondent are HND holders while 6.4% of the respondents have PhD degrees. Therefore, as seen that respondent with bachelor's and master's degree having the highest response rate, it is therefore evident that reliable information was provided by the respondents since most of them are well educated. Table 3.1 also revealed that that 38.3% of the respondents had 11-15 years of industry experience, 29.8% had 6-10 years of experience, 17% had 16-20 years in experience, and 10.6% had 1-5 years of experience while 4.3% had an experience of 20 years and above. This reveals that the majority of the respondents have an adequate amount of experience with construction related activities and are capable of providing meaningful information for this study. In addition, Table 3.1 revealed that 80.9% work in Privately Owned organization, while 14.9% are engaged by Public Limited Liability companies. Furthermore, 4.26% of the respondent practice in Partnership firms. The profile of respondents shown in Table 2 also indicated that 93.6% of the respondents are familiar with the sustainable concept while 6.4% of the respondents are not. Finally, the results presented in Table 3.1 revealed that 42.6% of respondents adopt 41-60 percent of sustainable construction practice in their organization, while 25.5% of respondents adopt 21-40 percent of sustainable construction practice. Furthermore, 17% adopt above 61 percent of sustainable construction practice and 14.9% adopts 0-20 percent of sustainable construction practice.

Table 2: Respondents' profiles

Profile	Frequency	Percentage (%)
Respondents' Profession in the Organization	Architect	10
	Builder	3
	Engineer	9
	Project Manager	4
	Quantity Surveyor	21
	<b>Total</b>	<b>47</b>
Respondents' Highest Level of Education	BTech/BSc	21
	MSc/MTech	19
	HND	4
	PhD	3
	<b>Total</b>	<b>47</b>
Respondents' Years of Experience	11-15 Years	18
	6-10 Years	14
	16-20 Years	8
	1-5 Years	5
	Above 20 Years	2
<b>Total</b>	<b>47</b>	
Respondents' Company Ownership Status	Privately Owned	38
	Public Limited Liability	7
	Partnership	2
	<b>Total</b>	<b>47</b>
Respondents' Familiarity with the Concept of Sustainable Construction Practice	Yes	44
	No	3
	<b>Total</b>	<b>47</b>
Respondents' Organization Rate in the Adoption of Sustainable Construction practice	0-20%	7
	21-40%	12
	41-60%	20
	Above 61%	8
<b>Total</b>	<b>47</b>	

Source: Uthman and Sulaiman (2025)

### 3.2 Cost Factors Influencing the Adoption of Sustainable Construction Practices

Table 3 revealed fifteen (15) cost factors influencing the adoption of sustainable construction practice. The most significant of the factors as revealed from result of analyses are; Initial capital cost, High cost of sustainable material and Limited financial incentives and with RII values of 0.86, 0.85 and 0.81 respectively. It was further revealed that Cost of renewable energy system, Maintenance and operational cost, Poor knowledge of life-cycle costing, Project financing and interest rate, Design and planning cost, Limited availability of sustainable technologies, Green building and certification cost, Lack of local sustainable material suppliers and Regulatory and compliance cost are very significant cost factors influencing the adoption of sustainable construction practices with RII values of 0.80, 0.78, 0.76, 0.75, 0.72, 0.71, 0.69 and 0.68 respectively. Other cost factors include: Cost of water management system, long payback periods and Cost of skilled labour and expertise were ranked to be significant with RII values of 0.60, 0.57 and 0.55 respectively. The findings from this study are consistent with [8] study on sustainable building processes challenges and strategies. Factors such as higher initial costs, higher costs of sustainable materials, inadequate training and education and unfamiliarity with green technologies were the key challenges that hinder the adoption of sustainable building processes. Furthermore, [43] revealed that financial incentives, government support, and increased awareness significantly reduce the burden of high initial costs, making sustainable construction practices more appealing and feasible for stakeholders.

Table 3: Cost Factors Influencing the Adoption of Sustainable Construction Practices

Code	Cost Factors Influencing the Adoption of Sustainable Construction Practices	RII	Rank	Decision
CF1	Initial Capital Cost	0.86	1 <sup>st</sup>	Extremely Significant
CF4	High Cost of Sustainable Material	0.85	2 <sup>nd</sup>	Extremely Significant
CF2	Limited Financial Incentives	0.81	3 <sup>rd</sup>	Extremely Significant
CF11	Cost of Renewable Energy System	0.80	4 <sup>th</sup>	Very Significant
CF5	Maintenance and Operational Cost	0.78	5 <sup>th</sup>	Very Significant
CF7	Poor Knowledge of Lifecycle Costing	0.76	6 <sup>th</sup>	Very Significant
CF15	Project Financing and Interest Rates	0.75	7 <sup>th</sup>	Very Significant
CF10	Design and Planning Cost	0.72	8 <sup>th</sup>	Very Significant
CF9	Limited Availability of Sustainable Technologies	0.71	9 <sup>th</sup>	Very Significant
CF6	Green Building and Certification Cost	0.70	10 <sup>th</sup>	Very Significant
CF13	Lack of Local Sustainable Materials Suppliers	0.69	11 <sup>th</sup>	Very Significant
CF12	Regulatory and Compliance Cost	0.68	12 <sup>th</sup>	Very Significant
CF14	Cost of Water Management System	0.60	13 <sup>th</sup>	Significant
CF8	Long payback periods	0.57	14 <sup>th</sup>	Significant
CF3	Cost of Skilled Labour and Expertise	0.55	15 <sup>th</sup>	Significant
<i>Average RII</i>		<i>0.72</i>		<i>Very Significant</i>

Source: Uthman and Sulaiman (2025)

### 4.0 Conclusion

This study identified fifteen (15) cost factors influencing the adoption of sustainable construction practice are very significant, with factors such as initial capital cost, high cost of sustainable material, limited financial incentives, cost of renewable energy system, maintenance and operational cost, poor knowledge of life-cycle costing, project financing and interest rates, design and planning cost, limited availability of sustainable technologies, green building and certification cost, lack of local sustainable materials suppliers, regulatory and compliance cost, among others. To enhance financial accessibility, there is need for policy makers and industry stakeholders to develop a comprehensive financial support framework. This framework should include targeted incentives such as grants, low-interest loans and tax benefits specifically aimed at reducing the initial capital burden and offsetting the costs of sustainable materials making it feasible for developers to pursue eco-friendly practices.

### 4.1 Recommendations

In view of the findings and conclusions of this study, the following recommendations were made:

- i. To increase financial accessibility for sustainable practices Policymakers and industry stakeholders should develop a comprehensive financial support framework. This framework should include grants, low-

- interest loans, and tax benefits to reduce the initial capital burden. Such initiatives would encourage developers to adopt sustainable materials and eco-friendly construction practices.
- ii. To improve awareness and understanding of sustainable construction, the study recommends the need to organize seminars, workshops and conferences to educate professionals, stakeholders and clients on the benefits and life-cycle costing on sustainable construction practices.

#### 4.2 Contribution to Knowledge

The findings of this study have contributed to the body of knowledge in the built environment in the following ways:

- i. The study revealed cost dynamics of sustainable construction practice thereby proposes a framework of grants, low-interest loans and tax benefits to address high initial costs, making sustainable construction more financially viable, especially in emerging markets
- ii. The study highlighted the importance of workshops, seminars and conferences to bridge knowledge gaps, thereby promoting understanding of life-cycle cost benefits.

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