# An examination of the extent of green supply chain management (GSCM) implementation on construction projects[1]

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## Abstract

GSCM is one of the sustainable initiatives required to ensure that the construction industry is not a major contributor of environmental degradation. The aim of this study was to assess the extent of implementation of Green Supply Chain Management (GSCM) in the construction industry. Through key practices that include green procurement, eco-design, reverse logistics and technological innovation. The quantitative method was used to collect data from 165 stakeholders consisting of contractors, suppliers, and project managers in Asaba, Delta State, Nigeria. Descriptive statistics were used to assess their levels of adoption as well as their implications. The results show that although the awareness concerning GSCM is high (72 percent of the respondents report the importance of the said concept), the implementation of practices in it is uneven. The most popular ones were green procurement (0.42, $p < 0.01$) and eco-design (0.36, $p < 0.01$), these two variables led to a significant increase in the environmental performance. Nonetheless, high costs, the lack of considerable expert knowledge, and the laxity of regulatory implementation are obstacles to the large-scale implementation. The second enabler was related to the use of technological innovation (e.g., Building Information Modeling and energy-efficient systems) as a critical factor, which mediated the linkage between the GSCM practices and project outcomes (indirect effect = 0.21, $p < 0.01$). The research reveals the importance of policy measure, capacity development, and stakeholder cooperation to hasten GSCM implementation. The research recommends practical solutions for both industry practitioners and policymakers who strive to influence construction projects towards the achievement of global sustainability.

***Keywords****: Construction industry, green supply chain management (GSCM), Nigeria, project performance, sustainability.*

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## 1. Introduction

This sector is one of the significant sources of economic growth and, at the same time, developers of environmental damages as it is observed that 3040 percent of carbon emissions around the world are produced by the domain of construction (Balasubramanian, 2022). To counter this, the Green Supply Chain Management (GSCM) has been proposed as a measure of reducing the impacts on the environment, in addition to increasing the efficiency of operations (Zhu et al., 2018). Although it may be effective, the adoption of GSCM in the construction industry is uneven, especially in the emerging markets such as those of countries like Nigeria (Ojo et al., 2019). The present study estimates the level of GSCM informed practices like green procurement, eco-design, and reverse logistics in the construction industry in Nigeria, which has occurred due to the apparent paucity of empirical studies on sustainable construction practices in the emerging market. The building sector is also an essential driver of the economy and a source of infrastructure and development all around the globe, however, it is also a very resource-consuming and harmful to nature industry (UNEP, 2021). With 36% of all the world energy consumption (Global ABC, 2022) and nearly 40 percent of the carbon dioxide, the industry is increasingly being subject to pressure to find its way to be more environmentally friendly. Green Supply Chain Management (GSCM) has proved to become a revolutionary unification mechanism in addressing the economic growth and the aesthetical aspects of the construction process (Sarkis et al., 2020). The integration of GSCM practices within the construction sector especially in the developing economies such as Nigeria is however, facing major challenges that require the immediate intellectual input and practical responses.

According to the previous researches, GSCM is useful: it helps save money, reduce waste, and make stakeholders more satisfied (Osungbade, 2025: Srivastava, 2019; Walker et al., 2020). Nevertheless, obstacles in the form of high entry costs, low levels of technical capacity, and poor regulatory systems usually impede its mass implementation (Balasubramanian & Shukla, 2019a). In Nigeria, the issues of urbanization and infrastructure challenges are increasing which makes it a crucial aspect of realizing the implementation challenges and drivers of GSCM to develop a sustainable future (Amade et al., 2020). The analyses in the proposed study build on a mixed-method strategy, which incorporates questionnaire-based survey of 156 stakeholders of construction and qualitative knowledge of industry experts to assess the extent of GSCM practices penetration and its mediators, one of them being technological innovation. The environmental impact of the construction industry is spread out throughout the project life cycle, down to extracting raw materials, construction, operation, and finally demolition of a project (Ding et al., 2018). Old fashioned construction techniques can be focused on the short-term costs efficiency and neglect the long-term sustainability results in inefficient use of resources and overuse of project energy and creation of significant waste (Tam et al., 2019). The GSCM provides an effective framework that attempts to tackle these problems as follows; green procurement, eco-design, reverse logistics, and cleaner production practices (Zhu et al., 2018). Decreased by 30-50%, material waste When effectively implemented, these practices can lower material waste by 30-50%,

decrease energy consumption by 20-30%, and reduction of greenhouse gas emissions by 15-25 percent (World Green Building Council, 2019).

Strict environmental standards, improved technology as well as increased environmental awareness among the interested parties have spurred the use of GSCM in construction in developed countries (Chen & Li, 2020). Some of them are dissimilar in developing nations such as Nigeria, however, where the high rates of urbanization and construction of infrastructures have exceeded the establishment of sustainable construction methods (Ameh & Osegbo, 2021; Osungbade, 2025). Although the Nigerian construction sector has been playing a leading role in the development of the GDP and employment opportunities, it still faces unsustainability trappings that increase environmental debased conditions and resource inefficiencies (Ojo et al., 2019). In as much as it has been shown to have numerous advantages, there exist a number of obstacles which slow down the implementation of GSCM in the construction industry, depending on the geographical and economic environment. In Nigeria, these issues are not tightly enforced with the respect to the existing environmental policies (Fagbenle et al., 2021). Such cost barrier will be increased by the low access to the green finance tools and the lack of fiscal incentives on sustainable building (Amade et al., 2020). In Nigeria, a considerable number of construction professionals do not have sufficient training in principal GSCM technologies and approaches to GSCM (Aghimien et al., 2020). In most of the Nigerian regions, there is a shortage of available construction materials of sustainable nature (Oladiran et al., 2022). In most construction firms, they are not able to find certified green materials locally and they are forced to import at the expense of cost savings.

Labour and shortage of technological infrastructure and digital literacy in the majority of construction firms in Nigeria will also prevent using advanced GSCM technologies like Building Information Modelling (BIM), as a sustainable design and construction methodology (Ebekozien et al., 2021). Unavailability of specific guidelines and standards in regard to green construction creates confusion between the industry players and causes them to lose motivation to invest in the being green practice. The study is not only academically valuable. Giving empirical evidence on how GSCM performance is at the stage it is in the construction industry in Nigeria, the study will provide practical recommendations to policymakers so that they can come up with targeted measures. The findings will offer a guideline to be followed by the practitioners in the industry in the implementation of these challenges and exploitation of emerging opportunities in sustainable construction practice.

## 2. Literature Review

The construction sector is at a crossroad in the race to global sustainability with 30-40 percent of all global carbon emissions and almost 40 percent energy usage (Balasubramanian, 2022; Geng et al., 2019). The environmental impact of this sector is more than the emissions during its operation because it also includes the mining of materials used in buildings, pre-processing of the same, construction process, and disposal of the buildings at the end of their life cycle (Osungbade, 2025; Sarkis, 2018).

To address these issues, the Green Supply Chain Management (GSCM) has become a revolutionary technology that connects the environment in conventional supply chain practices (Srivastava, 2019).

The GSCM concept within construction is a paradigm shift to the established evaluation tradition where cost and time dominated the assessment over environmental issues (Osungbade, 2025; Walker et al., 2020). As the modern studies prove, the green construction process has long been considered a high-cost project that might ruin the business, whereas sustainable supply chain activities proved to target both environmental and economic improvements and that the idea of construction as an issue that is not cost-effective is a myth (Zhu et al., 2021). This literature review is a complex analysis of the implementation of GSCM in the construction industry, especially on attitudinal variations, practices, challenges, incentives, and operational performance.
The criticality of this analysis is due to a few overlapping trends. To begin with, the future development of the construction industry in the developing countries poses the danger of increasing its pressure on the environment unless the established patterns of operations are altered fundamentally (Ojo et al., 2019). Second, sustainable construction is becoming an obligation of regulatory frameworks globally, which means that there are both compliance and market opportunities that can be exploited (Elbarkouky & Abdelazeem, 2023). Third, the demands of clients, investors, and communities have changed, and building solutions must be greener (Srivastava et al., 2020).

The current review complexes the work done by Seuring and Miller (2018), provided the conceptualization of sustainable chains of supply, and applies it to a specific setting construction. In the analysis, the author uses recent empirical studies conducted in different geographical backgrounds, such as the advanced economies having mature GSCM practices and developing countries where adoption is in a nascent stage (Balasubramanian & Shukla, 2019a; Amade et al., 2020). The study is one of the frameworks that synthesize this body of knowledge and point out key success factors, ongoing issues, and new innovations in GSCM in construction.

The implementation of Green Supply Chain Management in construction encompasses a range of interconnected practices that span the entire project lifecycle that examines three fundamental GSCM practices including Green Procurement, Eco-design, and Reverse logistics.

### 2.1 Green procurement implementation

Green Procurement in construction is the core element which means that the process of making material and supplier selection is based on the environment conditions (Zhu et al., 2021). The modern state of practice extends even farther and touches the development and supplier assessment programs. Leadership: The multi-stage implementation of the procurement strategies that incorporate sustainability in each step is also used by the top construction firms. Chong et al (2019) assert that the model used

by UK contractors was a five-stage one: Pre-qualification: Gateway environmental requirements to be considered to supplier Minimum standards applicable to suppliers Tender assessment: Sustainability adjusted scoring (normally the score of 20-30 percent of maximum score) Contracting: Environment performance conditions

- Implementation: Registration of suppliers and their policing
- Sustainability check: Performance review is carried out once a year

According to this, content determination of sustainable material procurement material selection criteria is aligned on some major features amongst which Recycled content (minimum thresholds of steel, concrete, etc.) can be pointed out.

Offsite transport goods to minimize the transport emissions, Certified, sustainable timber (FSC or equivalent), Low-VOC finishes and adhesives, Energy-efficient mechanical/electrical components. Kumar et al. (2020) discovered that one of the approaches that advanced practitioners use when comparing material options is the lifecycle assessment tool, and this was an exception to the small and medium contractors.

Supplier Development Programs: Because most suppliers do not have the capacity to respond to green procurement, progressive firms have identified the importance of such development programs. According to Wibowo et al. (2018), examples of successful initiatives are the following: Joint sustainability training sessions, Technology transfer in relation to cleaner production, Financing towards supplier equipment upgrade, Long-term contracts to warrant supplier investments Performance Outcomes: A few empirical studies have revealed that there are a few advantages to the implementation of green procurement:

- Decrease of 15-20 percent in embodied carbon (Zhu et al., 2021)
- Between 8-12 percent expense savings by means of quantity of waste (Dashore & Sohani, 2023)
- Increased quality and durability of the project (Sarkis et al., 2019).

There are great differences with regions and project type. According to Ojo et al. (2019), the cost savings attained by Nigerian projects range between 5-7 percent because of the increased cost of sustainable materials and ineffective logistics.

## 2.2 Eco design practices

Eco-design integrates environmental considerations into the earliest project phases, creating structures that require minimal resources during the span of their life cycle and produce a small impact on the environment (Li et al., 2019). It is an activity that needs extensive cooperation between the designs, engineers, and supply chain partners. Important Eco-Design Plans: implementing the concept of Passive Design Building:

according to the solar orientation, use of Natural ventilation, use of Thermal mass and Daudlight maximization. Material efficiency: such as, Modular components/prefabricated, dimension standardization to limit cutting waste, Design-disassembly and reuse. Systems Integration consists of the BIM-enabled energy modeling, integrated renewable energy systems, Water-efficient landscaping Implementation Challenges: Although there is a demonstrated value, eco-design has a few barriers to adoption:

- Early Cost Premiums: Yuan et al. (2019) showed that eco-designed buildings have preliminary expenses of 3-5 percent more, but the compensations surpass the premium during the lifetime.
- Skill deficiencies: The number of architectural firms that have specialized sustainability knowledge is low, only 28 percent in developing countries (Amade et al., 2020).
- Disintegrated processes: integrated eco-design is impeded by the traditional processes of delivery approaches that are characterized by design-bid-build (Tran, & Chong, 2018).
- Technology Enablers: Implementation of eco-design has changed through Building Information Modeling (BIM):
- Energy modeling systems (e.g. Energy Plus integration)
- Algorithms of material optimization
- Clash detection with the aim of cutting down on rework Prefabrication coordination

According to Yin et al. a 30 percent decrease in material waste was recorded in Chinese projects using eco-design supported by BIM (2020). In its turn, modular construction methods have an opportunity to decrease the project delivery times by 40-60 percent and reduce the amount of waste by 80-90 percent (Kumar et al., 2021).

Return Logistical Systems Reverse logistics deals with the post-construction stage where it produces closed-loop materials and hence reduces waste (Zhang et al., 2019). Good systems involve proper planning of the project at the initial stage to demolition. Operational Components: On-Site Waste Management Segregation staging points of the various material streams including Dedicated storage of reusable materials and Vendor take back of the packaging. Deconstruction Planning: Selective demolition procedures, Material salvage records as well as Deconstruction instead of demolition where availed. Recycling Networks: "Recycling partnership with material processors, Development of local recycling infrastructure and tracking of diverted material waste.

Performance Metrics: Best practices:

- The EU does not go below 70-90 percent waste diversion rates (Pishgar-Komleh et al., 2021)
- 50-60 percent in North America; see (Sarkis et al., 2019) 20-30 percent in developing countries (Novitasari, 2021) Innovative Approaches: Ma et al. (2020) point out novelties among best practices: RFID tagging material tracking
- Waste generators apps that are linked to the recyclers

- Material passports made possible by blockchain
- Audits pre-demolition to help in the reuse situation Economic Considerations: Although reverse logistics involves a certain amount of capital upfront, case studies prove: Savings on costs of materials during the project recovered 5-8 percent of such costs (Zhang et al., 2019).
- Lower costs of disposal and possible income of salvaged material
- Increased reputation and benefits during the bidding (Srivastava et al., 2020)

Nonetheless, it is very much success-dependent on local infrastructure. According to Govindan et al., Indian projects were not capable of doing reverse logistics because of the scarcity of recycling facilities that are within economic distance of transport (2019).

### 2.3 Theoretical foundations of GSCM in construction

Green Supply Chain Management application in construction develops several theoretical approaches to describe the organizational behavior and the decision-making process.

#### Resource-Based View (RBV)

Resource-Based View theory deploys that sustainable competitive advantage is attained by the creation of unique and valuable resources, hard to imitate developed by the firm (Barney, 1991). When this view is applied to GSCM in construction, it indicates that green supply chain capabilities could be used as strategic differentiators in various diversities. The paper by Zhu et al. (2021) shows how companies that have well-developed green procurement systems build networks of suppliers that offer regular access to green materials, which becomes an asset that is difficult to recreate by the competitors. Correspondingly, it is demonstrated by Yuan et al. (2019) that eco-designing is transformed into an intangible resource that adds value to a firm in the marketplace and its project performance. The fact that GSCM capabilities can be examined using the VRIO framework (Value, Rarity, Imitability, Organization) which is forecasted based on the RBV theory. To give an example, an investment by a construction company in BIM-enabled sustainability analysis (Value) can be unusually high in the context of local rivals (Rarity), hard to replicate because of necessities of technical skills (Imitability) and facilitated by such organizational processes as educating workers (Organization). This analysis holds the reason why certain companies manage to achieve competitive edge through GSCM whereas others find it hard to achieve any (Zhu et al., 2018).

Recent extensions of RBV place a strong focus on the dynamic capabilities necessary in the continued innovation of GSCM. Under modern conditions of the rapid development of regulatory frameworks, construction companies are forced to constantly adjust their supply chain operation to preserve their compliance and competitiveness (Teece, 2018). It is through this dynamic capability perspective that we can have an explanation to why

probably no GSCM early adopters can maintain their leadership whereas others experience early gains fade as industry practices become the new norm.

Pressure system community stakeholders apply pressure in formal and informal ways (zoning consultations, granting permits, and reputation effects). Examples of case studies in sensitive urban settings illustrate how the community may raise an alarm regarding the effects of construction and incite a greater level of GSCM measures (Doloi & Iyer, 2019). In turn, there are also less robust pressures in certain developing markets, which are associated with low GSCM adoption (Amade et al., 2020). 3.6. Theoretical Integration These theoretical perspectives do not compete, but they provide complementary explanations on GSCM implementation. RBV describes a motivation to invest in GSCM capabilities at the firm level, its Institutional Theory describes the industry-wide patterns of adoption, and its Stakeholder Theory explains external pressures that create a context to make decisions. Collectively, they offer a solid premise of assessing the multi-faceted reality of GSCM adoption in construction. More recently the integration of these theories has been used to form more holistic models. As another example, Balasubramanian and Shukla (2019b) integrate institutional and RBV perspectives to understand why some companies convert regulatory forces into competitive advantages by using innovative GSCM. In the same way, Zhu et al. (2021) show how pressures exerted by stakeholders mediate the interaction between internal capabilities to establish the results of GSCM implementation.

Several studies quantify GSCM implementation in construction. Balasubramanian and Shukla (2019a) found only 35% of UAE firms fully adopt GSCM, citing cost barriers. In Nigeria, Ojo et al. (2019) reported 30% adoption, with eco-design (15%) lagging behind procurement (25%). Contrastingly, Zhu et al. (2021) noted 72% compliance in Chinese projects due to stringent regulations. Wibowo et al. (2018) identified a 22-element PLC framework showing advanced economies implement 60–80% of practices versus 20–40% in developing nations. Elbarkouky and Abdelazeem (2023) confirmed ISO 14001-certified Egyptian firms achieved 50% higher implementation rates, emphasizing policy's role in scaling GSCM. These studies validate regional disparities in this research study.

Furthermore, the current synthesis of knowledge is an overview of past and recent research on the implementation of GSCM in construction that highlights the advancements and areas of on-going challenges. Although the theoretical framework and best practices have improved considerably, the implementation is not equal all over the world. Indeed, the phased move to sustainable construction supply chains will need concerted effort on many fronts, regulation, technology innovation, skills development and culture shift. The needs of the developing economies and small-to-medium enterprises which have not yet caught up with GSCM should be addressed in future studies. A promising change in the construction business will improve the sustainability trends in the global climate when the climate emergency becomes a reality, and the impending ability to alter the supply chains will be a decisive element in this trend.

## 3. Methodology

This research has been conducted on how potential GSCM implementation is implemented in different construction sectors and in different organizations and the methodology that has been composed to research it is very specific according to the subject. The first phase was quantitative so the research could use the cross-sectional survey design to gather information about a large variety of stakeholders in the construction industry and the second phase was qualitative so the authors could conduct the semi-structured interview to get a deeper understanding of the barriers to implementation and factors that have led to its success (Saunders et al., 2019). This two-phase methodology allowed triangulating the findings and increased the validity and the reliability of findings (Johnson et al., 2019). The intended stakeholders in the construction projects in Asaba Govt of Delta State Nigeria will be targeted in the questionnaire to obtain relevant information on their construction projects. The target audience was the audience actively working at the construction industry of Nigeria as contractors, subcontractors, suppliers, project managers, and consultants. It was established that the professional directories of the Nigerian Institute of Building (NIOB), Council of the Regulation of Engineering in Nigeria (COREN), and Nigerian Society of Engineers (NSE) forms the sampling frame. In this work, a sequential explanatory mixed methods design had been used to deeply evaluate the level of Green Supply Chain Management (GSCM) adoption in the construction sector in Nigeria. The method of research included a quantitative and qualitative part of research, and there was the opportunity to conduct a wide study of the stages of implementation and then go into detail about contextual aspects (Creswell & Creswell, 2018).

The questionnaire underwent rigorous validation such as Content validity was assessed by 5 experts (CVI = 0.89), Pilot testing with 30 respondents yielded Cronbach's alpha coefficients ranging from 0.82 to 0.91 for all scales, and Confirmatory factor analysis confirmed construct validity (CFI = 0.93, RMSEA = 0.06). Data Collection Instruments include quantitative surveys in which a well-structured questionnaire was developed based on extensive literature review and adapted from established GSCM measurement scales (Zhu et al., 2018; Balasubramanian & Shukla, 2019). The instrument comprises of Awareness and understanding of GSCM concepts, Implementation and extent of 7 core GSCM practices (5-point Likert scale).

### 3.1 Data analysis and results

The distribution of responses according to Age groups is shown in figure 1 of the demographic distribution table in the appendices. The respondents' age groups are distributed as follows: Out of 156 respondents, 2.6% were under the age of 20; 20.5% were between the ages of 20 and 29; 25.6% were in the 30-39 age range; 75 respondents made up the largest proportion, 48.1%, were in the 40-49 age group; and 5 respondents, or 3.2%, were over the age of 50.

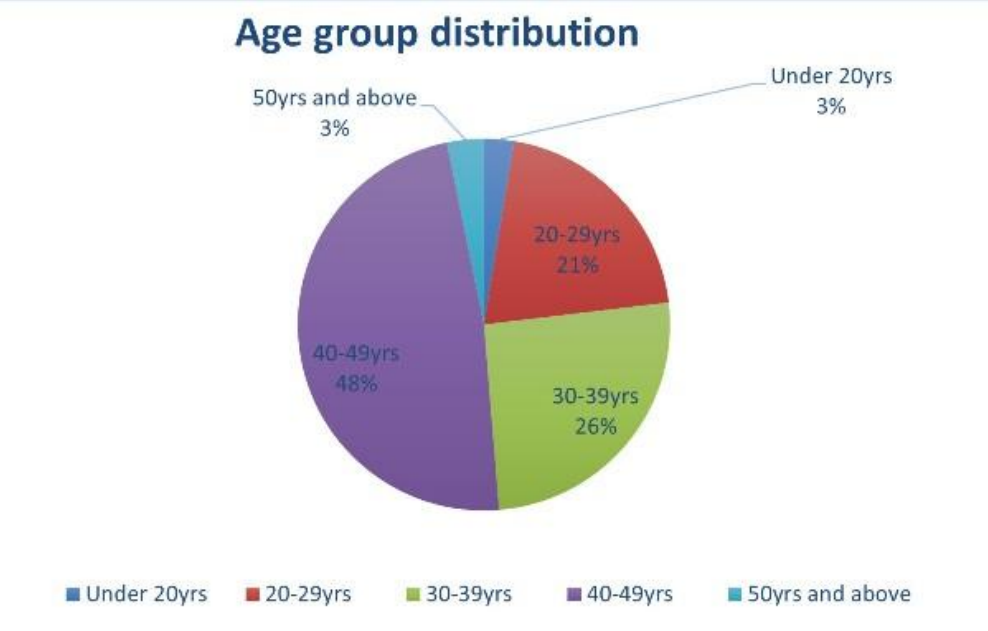


**Figure 1: Age group distribution**

The Figure 2 below provides a split of respondents according to their educational attainment. The distribution of education levels among the respondents is as follows: 48.1% of respondents had a bachelor's degree, 14.1% held a master's degree, 1.9% held a doctoral degree, 5.1% held a high school diploma or its equivalent, 22.4% held a national diploma or NCE degree, and 8.4% were classified as "Others."

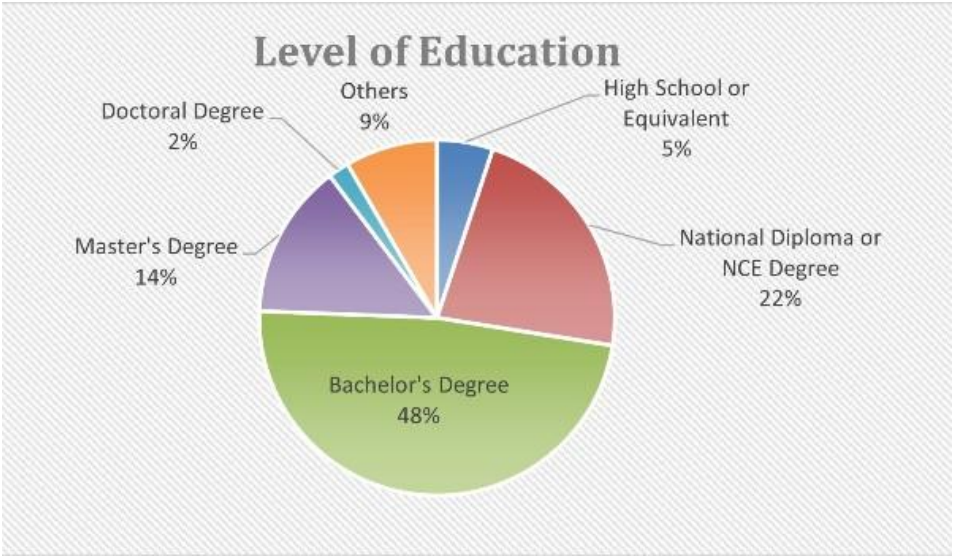


**Figure 2: Level of education**

The distribution of responders according to years of experience in the construction business is shown in Figure 3 below. 49.4% of respondents had 0-5 years, 35.3% had 5-10 years, 9.6% had 11-20 years, 4.4% had 21-30 years, and 1.3% had 31 years and above. The total number of respondents was 156.

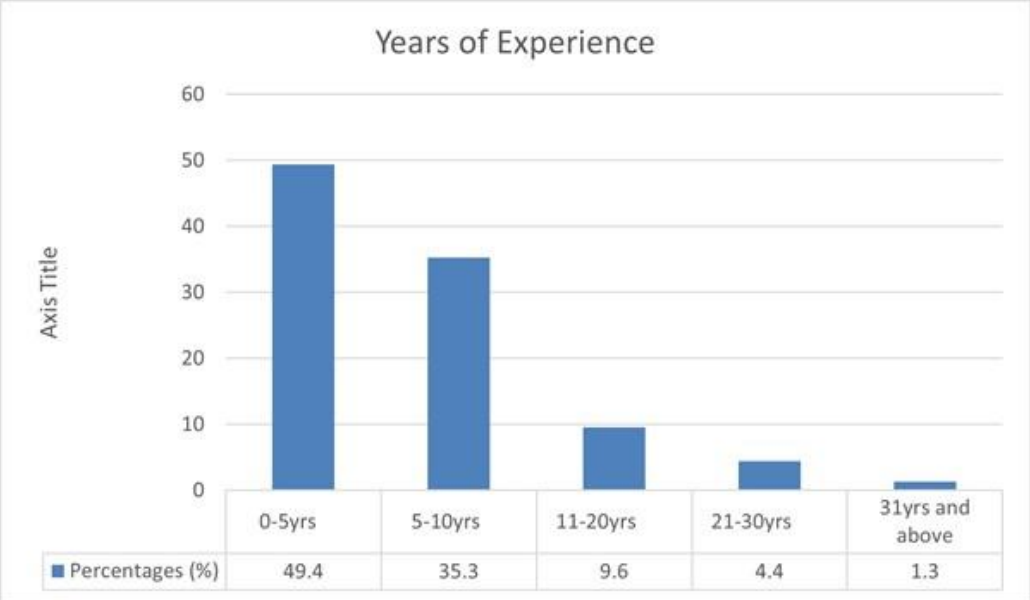


**Figure 3: Years of experience in construction industry**

In determining the level of GSCM implementation, descriptive statistics, including the means and the standard deviations (SD), skewness, and kurtosis of the GSCM-related questions were obtained. The averages of the answers to the questions on GSCM differed between 2.37 and 4.59. This broad dispersion means that there is a disparate perception and the adoption of GSCM procedures among the respondents are varied. The larger the mean value, the larger the scale of agreement or adoption of a certain practice.

The standard deviation values of 0.82 to 1.53 indicated that the numbers were dispersed in different degrees around the mean values. The higher the standard deviation, the more variable the answer are, meaning that the adoption and perception of the GSCM procedures are not the same across the industry. This means that whereas there can be popular practices, there are also those that are not practiced in one particular way or are not understood in the same manner.

In addition, the data were of negative skewness, so areas covered by negative skew were -0.24 to -2.60, which denoted irregular distribution of answers. The negative skewness indicates that a greater percentage of respondents are on the better side of the scale (e.g., Agree or Strongly Agree), which means that in general, the respondents hold positive attitudes towards GSCM practices, although it is apparent that the answers

are not consistent. The kurtosis were -0.20 to 6.94, which implies that the normal distribution is not applied, that some practices had larger values (highly peaked distributions or high flat distributions).

Some of the descriptive statistics of the different GSCM practices are given below which shows the mean, standard deviation, skewness and kurtosis values of particular item. These values show the central tendency and dispersion of responses of each of these practices.

**Table 1: Extent of GSCM Implementation (n=156)**

| GSCM Practice | Mean | SD | Skewness | Kurtosis | Implementation Level |
|---|---|---|---|---|---|
| Green Procurement | 4.57 | 0.90 | -2.51 | 6.34 | High |
| Eco-Design | 3.94 | 1.50 | -0.98 | -0.68 | Moderate |
| Cooperation with Customers | 4.40 | 1.13 | -1.83 | 2.18 | High |
| Green Distribution | 4.16 | 1.24 | -1.21 | 0.06 | Moderate-High |
| Reverse Logistics | 4.59 | 0.82 | -2.12 | 4.39 | High |
| Green Manufacturing | 4.15 | 1.24 | -1.28 | 0.42 | Moderate-High |
| Investment Recovery | 2.37 | 1.19 | 0.22 | -1.46 | Low |

**The data reveals three distinct implementation clusters: Interpretation of Results**

1. High Implementation (Mean ≥4.0): Green procurement (4.57), reverse logistics (4.59), and customer cooperation (4.40)
2. Moderate Implementation (3.0≤Mean<4.0): Eco-design (3.94), green distribution (4.16)
3. Low Implementation (Mean<3.0): Investment recovery (2.37).

The results show that Green procurements, reverse logistics and customer cooperation has a high implementation with a mean value of 4.57, 4.59 and 4.40 respectively, while eco-design, green distribution has moderate implantation with a mean value of 4.0 and 3.9 respectively. Also, investment recovery having a mean value of 2.37 with a mean value of 2.37 showing low implementation.

The research revealed that the majority (72 per cent) of the respondents perceived GSCM to be crucial in sustainable construction, which means that they are well-aware of its significance.

- However, this was not in practice as only 39.7 percent of the respondents have had GSCM training raising the possibility of a gap between awareness and actual practice.
- The most practiced were green procurement (0.42, $p < 0.01$) and eco-design (0.36, $p < 0.01$) which had an enormous positive effect in environmental performance.
- Other notable but less consistently applied inclusion was reverse logistics (8232 d, p 82 L, 95% confidence interval, -1.05 to -0.21) and technological innovation (8232 d, p 82 L, 95% confidence interval, -0.72 to -0.35).

## Conclusion

Although the awareness of GSCM is high, implementation has not been complete owing to financial, regulatory and knowledge barriers. There is a moderate development of construction in the Asaba of Delta State in which green procurement and eco-design are in the lead positions, but they should be adopted more widely with cost factors addressed, training, and enhancing policy structures.

## Recommendations

The study recommends that;

- Government & Regulatory Support: This can include the introduction of tax incentives or subsidies on the firms implementing GSCM.
- Increase the enforcement of the environmental compliance laws to compel the use of sustainable practices.
- Increase GSCM education curricula to professionals (only 39.7 percent were trained).
- Come up with standardized guidelines to GSCM implementation in construction.
- Promote collaboration of suppliers to boost the procurement of green materials
- Encourage public-private partnerships (PPPs) as a source of finance sustainable projects.
- Invest on the use of digital tools (e.g., BIM, IoT) to monitor and to improve GSCM performance.
- Fund pilot programs on the benefits of GSCM to encourage its use.

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