IMPLEMENTATION OF SUSTAINABLE CONSTRUCTION PRACTICE OF BUILDING PROJECTS IN SOUTH-SOUTH NIGERIA

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Abstract

This study assessed the implementation of sustainable construction practice (SCP) of building projects in south-south Nigeria. To achieve the purpose of the study, the study examined the level of awareness of the concept of sustainable construction practice and the level of implementation of sustainable construction practice in the study area. Also, considered was the relationship between the level of awareness and the level of implementation of SCP. The study adopted a questionnaire survey method distributed to construction professionals in the study area. A total of 327 questionnaires copies were distributed and 217 completed responses were received. Questionnaire was administered through online services. Data collected were analysed using frequency distribution, percentage, mean score, relative importance index and Pearson product-moment correlation coefficient. The result shows that the level of awareness of the concept of concept of sustainable construction was quite high with average mean of 3.51. The level of implementation of sustainable construction practice in the study area was reported as poor with an average mean of 2.63. Using the Pearson product-moment correlation coefficient to test the hypothesis of the relationship between the level of awareness and the level of implementation of SCP, the null hypothesis having a *p*-value .677 above 0.05 was not rejected. This indicates that there is no significant relationship between the level of awareness of the concept of sustainable construction practice and the level of implementation in the study area. The study therefore concludes that despite the high level of the awareness of the concept of sustainable construction practice in the study area, the level of implementation of sustainable construction practice has not received the deserving attention that it deserves. The study recommends that all stakeholders in the construction industry need to understand the importance of sustainable construction practice and implement it throughout all the phases of construction projects. The study further recommends the necessity for a paradigm shift in construction practices, moving beyond conventional approaches to adopt a more holistic, sustainable methodology that combines the best of traditional and modern techniques.

Keywords: Construction Industry, Construction Projects, Implementation, Sustainability, Sustainable Construction

Introduction

The implementation of sustainable construction practice is a worldwide orientation, with several nations creating plans, strategies, and policies to be employed in their construction industry (Aghimien, *et al.,* 2019; Alsanad, 2015; Ametepey, *et al.,* 2005). Sustainable construction enhances the quality of life for

citizens and helps to reclaim environmental fortunes lost due to human activity's depletion of the environment by providing for the basic needs of this generation without sacrificing the needs of future generations (Chofreh and Goni, 2017; Keeble, 1988). The construction industry frequently straddles the line between enhancing quality of life by providing the built environment and essential infrastructures required for development on the one hand, and upsetting the earth's natural stability on the other (Du Plessis, 2007; Al-Yami and Price, 2006). There has been an increase in demand for the exploration of natural resources, which has had an impact on the environment and compelled the involved stakeholders to find new solutions to lessen the consequences (Mensah, 2019; Wahab and Jegede, 2021). Thus, sustainability in construction can be defined as attempting to strike a balance between economic, environmental, and social factors in the design, construction, usage, and maintenance of structures. This can be seen in the practice of "green building" which adopts the idea of sustainable construction in the process of building (Akinyemi *et al.,* 2015).

The level of activities and the huge resources requirement of the construction industry and building sector suggests that there is a need for resource optimization and implementation of global best practice in the industry. Nigeria's economic growth and development have led to an increase in population, urbanisation, and industrialization which have put pressure on natural resources and the environment.

Buildings are still being constructed using the conventional system where design is separated from construction without sustainability considerations and because of the disintegration between the design and construction phase in the conventional/traditional system of construction process, construction problems and issues are still on the increase. According to Okoye, *et al.* (2022) sustainable construction practices are the ideal usage of sustainable materials and technologies in the design, construction and operation of construction projects for social and economic benefit of the people without detriment to the environment, now and in the future. But conversely, the conventional construction practices discount the connections between the construction facility, its components, surroundings, and users (Atombo *et al.,* 2015).

Elmualim and Alp (2016) assert that the construction industry should be the main sector in which the requirements of sustainability are met. But far from that expectation is the present reality especially in developing countries like Nigeria.

Babalola (2020), states that though the new wave of construction process is taking on a growing popularity backed by government policies in advanced economies, it has been draggy in developing economies such as Nigeria. In further corroboration Abolore (2012) notes that sustainable construction in Nigeria has not received the necessary attention it requires to positively impact on the way construction projects are executed in Nigeria just like other developing countries. Hence, arguably the construction industry in Nigeria has been wasteful and inefficient in its activities.

The level of environmental degradation, pollution, and hazards have become major challenges and this is currently affecting the quality of life of people in the south- south zone of Nigeria. The high level of pollution, poor construction and deterioration of construction works seen in the study area could be attributed to abysmal performance of construction process (Aghimien *et al.,* 2019).

Some projects in south-south are witnessing high level of degeneration in construction

practices and building standards. Projects are poorly conceived, carelessly planned and shabbily executed leading to poor indoor environmental quality and cost overrun (Simon-Eigbe, 2022). It has been discovered that the materials and energy used during construction process have serious effect on the environment. On this, Irurah in Okoye and Okolie (2013) suggest that construction process calls for a paradigm shift to a more sustainable agenda and this anchor on the various principles of sustainability.

Now the question is how should sustainability principles be integrated into the whole life of a building starting from the project planning process? This shows that there are strategies/approaches that should be considered throughout the planning process of a building in order to perform the sustainability integration successfully. The huge number of on-going building and infrastructure development projects and overall development-need presents opportunity to follow sustainable development path. Presently, the study on how to achieve sustainability during pre-construction, construction and post-construction has become very imperative. Based on the foregoing, the following hypothesis was postulated to direct the path of this study.

Hypothesis:

Ho: there is no significant relationship between the level of awareness and the level of implementation of sustainable construction practice among construction professionals in south-south, Nigeria.

The remainder of the paper is organised as follows: a brief overview of the relevant literature, the methodology applied in the study, the result of the study, the discussion and implications of the study, and the conclusions, recommendations.

Literature Review

The construction industry (CI) can be described as one which produces infrastructure that supports development (Du Plessis, 2007). Ayodele and Alabi (2011) assert that the construction industry makes a considerable contribution to the growth of any country's economy through its operations, provision of infrastructure, and economic contribution to GDP, making it a force to be reckoned with. Governments use the sector as a tool to provide citizens with the essential infrastructure they need (Ofori, 2015). Du Plessis (2002) explains, the construction industry as critical to shaping our future and ensuring its sustainability. The ongoing urban population growth and rapid urbanization places increasing strain on the city's already inadequate and limited infrastructure. Simon-Eigbe (2022) reports that the construction industry is complex due to the involvement of numerous stakeholders with divergent interests. Despite its complexity, the construction industry is critical to the nation's economic, social, and environmental sectors. The level of activity and the enormous resource requirements of the construction and building sector suggest that resource optimization and the implementation of global best practices in the industry are required.

Thus, the challenge for the construction industry in developing countries is not just to respond to the development challenges of adequate housing, rapid urbanization and lack of infrastructure but to do it in a way that is socially and ecologically responsible. The strategy developed by the A21 provides a broad framework to guide the development of such responses (Du Plessis, 2007). Also, Svetlana (2019) in agreement resolve that it is now critical to seek new approaches and apply creative and innovative solutions to the improvement of the construction process to be competitive and sustainable on the marketplace. Abolore (2012), corroborated that the degradation of the environment is

already affecting the quality of life of people around the world. Hence, the value of the construction industry in a developing country like Nigeria cannot be overstated.

Increased calls for the adoption and subsequent implementation of sustainable construction (SC) in the various sectors have arisen as a result of the deteriorating climatic conditions that are perceived as consequences of global warming, resource depletion, land degradation, and water and air pollution, among others. The construction industry (CI) has come into emphasis because of its connections to other sectors. There is evidence to support the claim that it is the primary cause of the disruption of the ecosystem and the depletion of the earth's resources (Alsanad, 2015; Opoku and Ahmed, 2014). The CI's reaction to this appeal is known as sustainable construction (SC), and sustainable construction practices are the means by which the institutions participating in this sector apply the sustainable development (SD) guidelines to their operations and business plans. Atombo *et al.* (2019); Elmualim and Alp (2016); Esezobor (2016); Kinebar and Hamed (2022); Simon-Eigbe, (2022) corroborate that SC is the implementation of SD concepts throughout the whole building cycle, beginning with the planning and design phases and continuing through the actual construction phase, which encompasses the manufacturing of materials. Operation and maintenance are the final two phases, which are then followed by deconstruction and management of the generated garbage.

Policymakers now more than ever view the idea of sustainability and its practical application as one of the most important tools for striking the correct balance between economic, social, and environmental goals (Abolore, 2012).

Methodology

Research design

The aim of the study is to determine the level of implementation of sustainable construction practice and to achieve that a descriptive survey research approach was adopted. This is because survey research allows for collecting data from a large number of participants quickly and efficiently, it is cost-effective, flexible, suitable for descriptive research and can be used to cover geographically stretch samples such as in this study (Okoye *et al.,* 2022). The study area is South-South Nigeria and covered construction professionals in the study area. Although the South-South Nigeria is just one region in Nigeria, is a strategic choice for assessing the level of implementation of sustainable construction practice in the construction industry in Nigeria because of the high construction activities there. The region is experiencing rapid urbanisation and development, leading to numerous construction projects, making it an ideal location to assess sustainable construction practice. The average population density for the study area is approximately 343 people per square kilometre (National Population Commission of Nigeria, 2020).

The study made use of structured questionnaire administered to the selected building construction professionals in the study area. Questionnaire is the most appropriate tool that ensures minimal bias and wider spread (Fellows and Liu, 2015). More so, it will be sent out to respondents via email and post and filled at the convenience of the respondents thus enabling a wider geographical coverage. The questionnaire designed for the study was a structured questionnaire (multiple choices) and included closed ended questions. The questionnaire consisted of two sections, A and B with the first part, part A covering the demographic of the details of the respondents. The part B based on the

objectives of the study. The statements made therein were measured accordingly.

Sampling and sampling technique

The population of the study was made up of all the relevant registered building construction professionals as obtained from the register of various professional bodies in the study area. Therefore, the population for the study covered 1802 respondents. These are the construction professionals believed to have adequate knowledge and experience on related construction issues in the study area. The sample size for this study was determined using Taro Yamane's formula, Yamane (1978). The sample size of 327 is adopted for this study.

The study employed a multi-stage sampling procedure in selecting the desired respondents. To begin with, cluster sampling technique was employed where the samples were proportionally divided into six to ensure that the respondents from each of the six states in the study area were adequately represented in the survey (area coverage). Next, a simple random sampling technique was used in choosing the respondents from each state (cluster). Based on this, a total number of three hundred and twenty-seven (327) questionnaires was distributed to construction professionals through online. The questions were harnessed towards achieving the research objectives and clear having a bearing on the A sample of three hundred and twenty-seven (327) was calculated as adequate for a population of 1802 respondents. The questionnaire was sent out and two hundred and seventeen (217) responses were received and found useful for further research purposes. research questions. The questions were methodised to ensure consistency and avoid indefiniteness.

Method of data analysis

The data generated from the survey were subjected to descriptive analysis. To achieve the primary objectives of the study, quantitative analytical tools were employed. In order to portray the results for better understanding, the data was presented in tables. The techniques included relative frequency distribution (percentages), mean item score (MIS), analysis of variance (ANOVA), student Z-test and Pearson Correlation Coefficient. As stated in the introduction, a null and alternative hypothesis of significant relationship between the level of awareness of the concept of sustainable construction practice and the level of implementation of sustainable construction practice were tested using Pearson Correlation Coefficient. Meanwhile mean item score (MIS), analysis of variance (ANOVA), student Z-test was applied to measure the level of awareness of the concept of SCP and level of implementation of SCP based on the respondents 'role.

Decision Rule: Reject H0 if $p < 0.05$ otherwise, do not reject H0 and conclude.

Results

Respondents' background

As indicated in Table 1, it shows the organisation type of respondents where 60 respondents representing 27.6% are from construction company/organisation, 55 respondents representing 25.3 are from contract/contracting firm, 41 respondents representing 18.9% constituted the consulting firm, 36 respondents representing 16.6% of the population are others from educational background. The remaining 13 and 12 respondents representing 6.1% and 5.5% are from public contracting firm and public consulting firm respectively.

The professional background of the respondents, 34.6% were Quantity Surveyors, 20.7% were Builders, 14.3% were Engineers, 13.8% were Town Planners and 12.9% were Architects. Other

professionals within the industry constituted the 3.7%.

The Table 1 further shows the academic qualification of the Respondents where 73 respondents representing 33.6% possessed M.Tech/M.Sc degree, 66 respondents representing 30.4% have HND, 63 respondents representing 28.6% possessed B.Tech/BSc while 16 respondents representing 7.4% possessed PhD. Also, 39 respondents representing 18% have worked between 1-5 years, 31 of them representing 14.3% have worked between 6-10 years, 47 respondents representing 21.7% have worked between 11-15 years and 66 respondents representing 30.4% have worked between 16-29 years, while 34 respondents, representing 15.7% have worked over 20 years. The trend therefore, shows that the respondents are experienced and as such can provide informed opinion about the subject matter.

Table 1: Analysis of Background Information

Variable	Characteristics	Frequency	Percentage (%)	Total
Institutional Organization	Contract/Contracting firm	55	25.3	
	Construction Company/Organization	60	27.6	
	Consulting Firm	41	18.9	
	Government (Public Contracting)	13	6.0	
	Government (Public Consulting)	12	5.5	
	Other (Education etc.)	36	6.6	217
Profession	Architect	28	12.9	
	Quantity Surveyor	75	34.6	
	Engineer (MEP or Civil)	31	14.3	
	Builders	45	20.7	
	Town Planners	30	13.8	
	Others	8	3.7	217
Qualification	OND/ND	-	-	
	HND	66	30.4	
	BSc/BTech	62	28.6	
	MSc/MTech	73	33.6	
	PhD	16	7.4	217
Years of Profession Experience	1-5	39	18	
	6-10	31	14.3	
	11-15	47	21.7	
	16-20	66	30.4	
	20years and above	34	15.7	217

The level of awareness of the concept of sustainable construction practice

The Cronbach Alpha value for the data was quite high (0.959) validating a good reliability. Additionally, the data's validity is quite good because every variable is significant at a 99% confidence level. According to the findings, respondents indicated that they are very aware of 57.14% of the identified sustainable construction practices i.e. (SCP10, SCP3, SCP8, SCP12, SCP13, SCP6, SCP14 and SCP7) as they all

have their mean between 3.5 and 4.49. The respondents also indicated that they are aware of 42.86% of the identified sustainable construction practices i.e. (SCP5, SCP9, SCP2, SCP1, SCP4, SCP11) as they all have their mean between 2.5 and 3.49. Cumulatively, the respondents are very aware of sustainable construction practices with an average mean of 3.51. The standard deviation also shows that the responses are spread out, having an average standard deviation of 1.06.

Table 2: Descriptive statistics of the level of awareness of the concept of SCP

Code	Variable name	Cronbach's Alpha	Validity	Mean	Std. Deviation
SCP10	Planning for effective waste management during construction and demolition	0.956	0.000	3.680	1.012
SCP3	Controlling or Regulating water usage or waste	0.957	0.000	3.640	1.018
SCP8	Innovative and sustainable site planning	0.955	0.000	3.640	1.032
SCP12	Considering the impact of projects on the environment (Project Lifecycle Assessment)	0.956	0.000	3.620	1.035
SCP13	Use of renewable materials	0.955	0.000	3.610	1.036
SCP6	Choosing a suitable or the right construction method to conserve resources.	0.956	0.000	3.600	1.028
SCP14	Using energy-saving equipment or alternative	0.955	0.000	3.600	1.054
SCP7	Use of pesticides and cleaning products with no environmental impact on construction sites	0.957	0.000	3.510	1.127
SCP5	Using energy-saving equipment or alternative energy sources	0.956	0.000	3.440	1.092
SCP9	Utilizing noise barriers on site	0.956	0.000	3.430	1.039
SCP2	Dust control to lessen environmental or building pollution	0.958	0.000	3.420	1.065
SCP1	Collection and Storage of Recyclables	0.957	0.000	3.400	1.076
SCP4	Control of carbon emission	0.956	0.000	3.370	1.099
SCP11	Fundamental Refrigerant management	0.957	0.000	3.230	1.160

The level of implementation of sustainable construction practice (SCP)

The Cronbach Alpha value for the data was quite high (0.974) validating a good reliability. Additionally, the data's validity is quite good because every variable is significant at a 99% confidence level.

According to the findings, respondents indicated that 90% of the identified sustainable construction practices i.e. (LoI8, LoI1, LoI4, LoI9, LoI6, LoI2, LoI5, LoI10 and LoI3) are moderately implemented in their construction sites as they all have their mean between 2.50 and 3.49. The respondents also indicated 10% of the identified sustainable construction practices i.e. (LoI7) is less implemented in their construction sites as it has its mean between 1.5 and 2.49. Cumulatively, the all the identified sustainable construction practices are moderately implemented on construction sites with an average mean of 2.63. The standard deviation also shows that the responses are spread out, having an average standard deviation of 1.22.

Table 3: Descriptive statistics of the level of implementation of SCP

Code	Variable name	Cronbach's Alpha	Validity	Mean	Std. Deviation
LoI8	Considering the impact of projects on the environment	0.971	0.000	2.840	1.192
LoI1	Sustainable Design application	0.971	0.000	2.770	1.199
LoI4	Indoor Air Quality	0.972	0.000	2.740	1.189
LoI9	Project Life cycle assessment	0.971	0.000	2.710	1.208
LoI6	Sustainable Building Materials use	0.970	0.000	2.690	1.331
LoI2	Energy Efficiency application	0.971	0.001	2.590	1.188

LoI5	Water Conservation	0.970	0.000	2.560	1.185
LoI10	Use of renewable materials	0.973	0.001	2.520	1.302
LoI3	Waste Reduction	0.970	0.001	2.510	1.259
LoI7	Fundamental Refrigerant management	0.971	0.000	2.350	1.193

The relationship between the level of awareness of the concept of sustainable construction practice and the level of implementation of SCP

The relationship between the level of awareness and the level of implementation of sustainable construction practice which was investigated using Pearson product-moment correlation coefficient. Criteria for effect size, Small/Weak r =.10 to .29 Medium/Moderate r =.30 to .49 Large/Strong r =.50 to 1.0. (Pallant, 2016).

Pearson correlation was used to test the results in Table 2 on the level of awareness of sustainable construction practice among construction professionals and Table 3 on the level of implementation of SCP in south-south Nigeria resulted to Table 4 which was used for correlation. The Pearson product-moment correlation coefficient in Table 4 shows that the *p*-value is .677 which is above 0.05.

Given the confidence interval at 0.05, the null hypothesis will not be rejected. This is because the correlation is not significant as seen from Table 4 where *p*-value is .677 > 0.05. It was therefore concluded that there is no significant relationship in the level of awareness of the concept of sustainable construction practice and the level of implementation of sustainable construction practice among construction professionals in the study area.

Table 4: Correlations on the level of awareness of the concept of SCP and the level of implementation of SCP

		Awareness	Implementation
Awareness	Pearson Correlation	1	-.028
	Sig. (2-tailed)		.677
	N	217	217
Implementation	Pearson Correlation	-.028	1
	Sig. (2-tailed)	.677	
	N	217	217

Discussion

Level of awareness of the concept of sustainable construction practice

The survey result shows that the professionals are very aware of the principles of sustainable construction. According to the findings, 54,17% of the respondents indicated that they are very aware of the identified methods and procedures of sustainable construction practice: They were ranked as SCP10, SCP3, SCP8, SCP12, SCP13, SCP6, SCP14 and SCP7 all have their mean between 3.50 and 4.49. SCP5, SCP9, SCP2, SCP1, SCP4 and SCP11 have their mean between 2.50 and 3.49 which represented 42.86% of the respondents also indicated that they are aware of the identified sustainable construction practices. Cumulatively, the respondents are very aware of sustainable construction practices with an average mean of 3.51. The standard deviation also shows that the responses are spread out, having an average standard deviation of 1.06.

This result indicates that the professionals are very conversant with the requirements of sustainability as previously observed by Akadiri *et al.* (2012). The result also agrees with Babalola (2020) work where he observed that the knowledge and awareness

of sustainable construction practice by stakeholders (professionals) is high. Isang (2023) also reported that the concept of SC in Nigeria has evolved from initial obscurity to an advancing ground. Otali and Ujene (2020) equally concluded that level of awareness of sustainability practices is high in their investigation of the level of awareness of sustainability practices among construction firms in Niger Delta.

However, Okoye *et al.* (2022) reported otherwise suggesting that sustainable construction concept has not been deeply rooted in the Nigerian building construction industry due to certain factors related to knowledge and awareness, cost, regulatory framework, construction materials and socioeconomic issues that call for special attention, while implementing sustainable construction practices. They therefore, concluded that there is need for more awareness of sustainable construction among building industry stakeholders.

Level of implementation of sustainable construction practice

From the analysis in Table 6, the result shows that 90% (LOI8, LOI1, LOI4, LOI9, LOI6, LOI2, LOI5, LOI10 and LOI3) of the identified sustainable construction practices are moderately implemented in their construction sites as they have their mean between 2.50 and 3.49 while the remaining 10% (LOI7) respondent indicated that the identified sustainable construction practices is less implemented in their construction sites as it has its mean between 1.50 and 2.49. Cumulatively, the identified sustainable construction practices are moderately implemented with an average mean of 2.63 which is less than 3.00. This is considered statistically as not significant (Kothari, 2009). The result shows that there is poor implementation of sustainable construction practice in the industry.

The level of awareness of the concept of sustainable construction practice and the level of implementation of SCP

Despite the high level of the awareness of the concept of SCP in the study area, the implementation of sustainable construction practice has not received the deserving attention that it deserves. The study demonstrates that the poor implementation of SCP is not as a result of lack of awareness because the respondents claim to be very aware of the concept of sustainable construction practice. This study is at variance with the report of Okoye et al. (2022) stating that the level of implementation of sustainable construction in the building industry has been found to be low as result of the concept of sustainable construction is still being new to the Nigerian construction industry. They argued that given the prevailing structure of the building construction industry and the current construction practices in Nigeria, it can be posited that construction professionals lack adequate familiarity with the potential risks associated with the implementation of sustainable construction methods, which hinders the widespread implementation of sustainable construction practices in the country.

Abidin (2010) also reported differently from this study stating that the implementation of sustainable construction begins with the awareness and interest. Djokoto *et al.* (2014) also agreed that sustainable construction can be held back by lack of understanding or ignorance of goal of sustainability. There is need therefore to consider how sustainability principles can be integrated into construction project delivery.

Conclusion

There are strategies/approaches that should be considered throughout the planning process of a building in order to perform the sustainability integration successfully.

Therefore, the need for an insight into the implementation of sustainable construction practice in the Nigeria building industry. The study has therefore, assessed the implementation of sustainable construction practices in South-South Nigeria. It was found that the level of implementation of sustainable construction in the study area is poor. It was great to ascertain that the concept of sustainable construction was understood by a greater number of the construction professionals in the study area. The relationship between the level of awareness of the concept of sustainable construction practice and the level of implementation was analysed. It was revealed that there is no significant relationship between the two as the level of implementation is not commensurate with the level of awareness. This shows that despite the high level of the awareness of the concept of sustainable construction practice in the study area, the implementation of sustainable construction practice has not received the deserving attention that it deserves.

The study highlights the necessity for a paradigm shift in construction practices, moving beyond conventional approaches to adopt a more holistic, sustainable methodology that combines the best of traditional and modern techniques. Moreover, it stresses the importance of government agencies and construction professionals 'engagement in promoting sustainable practice, justifying the need for a collective commitment to environmental management in the industry. The study recommends that all stakeholders in the construction industry need to understand the importance of sustainable construction practice and implement it throughout all the phases of construction projects and not just at the actual construction phase.

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