

Understanding the Critical Barriers to Implementing Sustainable Development Principles in Housing Project Delivery in Anambra State, Nigeria

Fidelis O. Ezeokoli¹, Chiagozie B.N. Bert-Okonkwo¹, Fadumo D. Oluwatayomi¹, Cosmas O. Ehimioboh², Michael I. Okongwu¹ and Arinze U. Okeke¹

¹Department of Building, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria

²Department of Building, Dennis Osadebay University, Asaba, Delta State, Nigeria

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ABSTRACT

Housing is integral to human existence and development and is core to achieving sustainable development goals (SDGs). Recently, SDGs have dominated discourse in built environments globally. However, in Nigeria and particularly in the study area, the effects of these discussions and research have yet to yield the desired results. Therefore, this study examines the barriers to applying SD principles in Housing Project Delivery in Anambra state, Nigeria. Being survey research, the study used a questionnaire to source data for the study. 78 questionnaires were administered while 62 questionnaires were returned and validated for analysis. Analysis of the data employed descriptive and inferential statistical tools. Particularly, arithmetic mean and standard deviation were used to estimate the behaviour of the data series while the principal component method of Exploratory Factor Analysis (EFA) was utilized in assessing and extracting the key barriers of Sustainable Development (SD) Principles in Housing Project Delivery in Anambra State. The choice of the Principal Component Analysis (PCA) method of EFA was because of its capacity to remove severe autocorrelation from the data series and then, produce stable and reliable orthogonal results which in this case, was used for Sustainable Development (SD) Principles in Housing Project Delivery in Anambra State. The study found that key constraints to SDP application in housing are the lack of legislation/enforcement/monitoring by government agencies and lack of awareness of the perceived benefits of SD to the end-users; which have significantly affected the application of SDP in Housing Project Delivery. The study concluded by recommending that an integrative approach/framework that will involve all the key stakeholders in the construction industry with appropriate legislation and legal backing be developed and religiously enforced and monitored with appropriate education and training on the importance and needs of SD to the end-users in the study area.

Keywords: Sustainable development, Sustainable development goals, Sustainable construction Sustainable Housing, Project Delivery.

INTRODUCTION

Housing involves providing harmless, calm, affordable, and well-designed dwellings in a proper setting within the neighborhood; which must be supported by continuous maintenance aided by a maintenance manual (UN-Habitat for Humanity, 2015). According to Jiboye (2009), Ehimioboh, (2022); Ezeokoli, Ehimioboh, Okoye, & Ekekezie, (2023); Ezeokoli Ehimioboh, Iheama & Enebe, (2025) housing is an integral part of individual and family wellbeing and development. Its use in assessing the standard of living which reflects socio-economic and cultural aspirations and preferences (Jiboye, 2009). Housing is a key component of the built environment that plays a significant role in the realization of Sustainable Development Goals (SDGs) (Iurevna, et al., 2024; Ezeokoli, Ehimioboh, Okoye & Ekekezie, 2023; UN-Habitat, 2021; Uwazie, Igwemma, & Okonkwo, 2015). Because, it affects ecological preservation, social efficiency, and economic stability (Iurevna, et al., 2024; Srivastava et. al., 2024; Shahmohammad et. al., 2024; Khizar et. al., 2023). Housing contributes toward building better settlements and cities (UN-Habitat, 2021). Hence, the right to adequate and affordable housing

could significantly improve health, education, and economic opportunities has dominated academic discourse globally (UN-Habitat, 2021; Alitheia, 2010). SD is an approach to development that uses resources in a way that allows them to continue to exist for others to achieve environmental equilibrium, economic growth, and social progress (Mensah, 2019; Zhai & Chang, 2019; Gossling-Goidmith, 2018). Simply put, SD is a development that meets the needs of the present without undermining the needs of future generations to meet their own needs (WCED, 1987). SD initiatives are aimed at advancing development and fostering a more favourable future (Sorooshian, 2024); and is a core concept that has attained global development, policy, and agenda and has dominated research in the built environment globally (Cerin, 2016; Abubakar, 2017). Also, Rotimi (2016), observed that SD problems have dominated policy discussion globally, but with little actual results in terms of complex global environmental problems like climate change. Where progress has been made on some of the SDGs but little progress in sustainable cities and housing. The 2024 SDGs report reveals some sobering statistics that only 17% of the Global Goals targets are on track, while half show limited progress, and over one-third are stalling or regressing (Iyanda & Olatunji, 2024). Because, the SDGs/MDGs concentrated largely, though not exclusively, on social outcomes while key development priorities, such as infrastructure and energy, were absent from the list (Rotimi, 2016).

Conversely, sustainable housing (SH) is the provision of housing that integrates environmental and societal best practices to reduce the negative impacts of homes on the environment through the use of eco-friendly design, sustainable building materials, and construction practices (Gikison and Sexton, 2007). SH construction practices reduce contributions to drivers of climate change, improve the resilience of buildings in disaster, reduce risk, promote preparedness, and reduce social vices (UN-Habitat, 2021; Omopariola, Albert & Windapo, 2019; Leibrock & Harris, 2011). SH also enhances the quality of life, improves client satisfaction, provides desirable natural and social environments, and efficiently uses resources (Omopariola, Albert, & Windapo, 2019).

Nigeria, like many other developing countries, faces significant housing challenges. The country's rapid urbanization, population growth, and poverty have resulted in a severe housing deficit, estimated to be over 17 million units (Federal Government of Nigeria, 2017). To address this challenge, the Nigerian government has developed a National Housing Policy (NHP), which aims to provide affordable and decent housing for all citizens. The NHP was first introduced in 1991 and has undergone several reviews and updates. In recent years, the Nigerian government has taken steps to review and update the NHP. The 2017 National Housing Policy Review Report recognized the need for a more inclusive and participatory approach to housing policy development and implementation (Federal Government of Nigeria, 2017). The policy's primary objective is to ensure that all Nigerians have access to safe, secure, and affordable housing (Federal Government of Nigeria, 2017). However, despite the policy's good intentions, its implementation has been plagued by several challenges. Also, being a signatory to SDGs Nigeria has demonstrated strategic foresight by adopting several long, medium and short-term development plans/initiatives to achieve its objectives to accelerate national development and develop an actionable framework for SDGs implementation. Some of these efforts include but are not limited to the National Economic Recovery and Growth Plan (ERGP) (Oweibia et. al., 2024), and the establishment of the office of the Senior Special Assistant to the President on Sustainable Development Goals (SSAP-SDGs) (Office of the SSAP-SDGs, 2017; Ekere, 2023) among others. While there seems to be a structure in place in Nigeria for effective implementation of SDGs, recent SDGs ranking on a global scale are worrisome. For instance, in 2020, 2021, 2022, 2023, and 2024 Nigeria ranked 160th, 160th, 136th, 146th, and 146th respectively (Sachs et al. 2021, Kayode, 2022, Iyanda & Olatunji, 2024, Sachs, Lafortune, & Fuller 2024).

Many years after the enactment of NHP; the provision of sustainable housing and incorporation of SD principles into the housing sector has been bedevilled with too many challenges despite the volume of available research in this area. One significant problem with the NHP is the lack of effective implementation and enforcement. The policy's objectives and strategies have not been adequately translated into actionable plans, resulting in a lack of progress in addressing the country's housing challenges (Agbola & Olatubara, 2012). Furthermore, the policy's implementation has been hindered by inadequate funding, bureaucratic bottlenecks, and corruption (Ogu, 2005). Another problem with the NHP is the lack of stakeholder participation and engagement. The policy's development and implementation have been largely driven by the government, with limited input from key stakeholders, including housing experts, community leaders, and civil

society organisations (Adequate, 2017). This has resulted in a policy that does not adequately reflect the needs and aspirations of the Nigerian people. Additionally, the NHP has been criticised for its narrow focus on quantitative targets, such as the number of housing units to be built, rather than qualitative outcomes, such as the quality and affordability of housing (Ukoha & Beamish, 2017). This has resulted in the development of housing estates that are often unaffordable and inaccessible to low-income households.

Concerning housing sustainability, Turcotte & Geiser (2010) argue that most literature on sustainable housing focuses on environmental aspects. In addition, there is little public knowledge about SDGs and how governments across levels factor the SDGs into development projects (Njoku 2016). Sustainable development in the housing and construction industry involves balancing environmental, social, and economic considerations (Elkington, 1994). The three dimensions of sustainable development - environmental, social, and economic sustainability - are interconnected and essential for creating sustainable buildings and communities (WCED, 1987). By applying principles such as intergenerational equity (WCED, 1987), social justice and equality (UN, 2015), and precautionary principle (Rio Declaration, 1992), the industry can promote sustainable development and create buildings and communities that meet the needs of present and future generations.

Hence, in Nigeria generally and in the study area mainly, the effects of the current research and discussions in SD are yet to yield the desired results despite its commitment to SDGs, Nigeria has continued to lag in socio-economic development that targets the goals (Ajala 2022; Ejiogu, Ejike & Ohazurike 2024). This is because there are persisting and significant obstacles that have continued to impede the country's progress towards attaining and improving socioeconomic conditions and environmental sustainability (Oweibia et. al., 2024). This entails that progress made towards SDGs/SH/SC has been sluggish, and several gaps need to be addressed to ensure successful implementation. Thus, this study examines the critical constraints to implementing sustainable development principles (SDPs) in housing project delivery in Anambra State, Nigeria. Based on the research purpose, this hypothesis was formulated:

H₀: The barriers do not significantly influence the extent of application of Sustainable Development (SD) Principles in Housing Project Delivery in Anambra State; and

LITERATURE REVIEW

Dimensions/Principles of Sustainable Development

Sustainable development is a multifaceted concept that encompasses various dimensions and principles. In the context of the housing and construction industry, sustainable development is crucial for creating environmentally friendly, socially responsible, and economically viable buildings and communities. The three primary dimensions of sustainable development are environmental, social, and economic sustainability (Elkington, 1994; WCED, 1987). In the housing and construction industry, these dimensions manifest in various ways:

Environmental sustainability focuses on reducing the environmental impacts of buildings and construction processes. This includes using sustainable building materials, reducing energy consumption and greenhouse gas emissions, and promoting green infrastructure (IPCC, 2014). For instance, the use of sustainable building materials like bamboo and low-carbon cement can significantly reduce the environmental footprint of buildings (Singh Venkatesh, & Jönsson, 2019).

Social sustainability emphasizes human well-being, equality, and justice in the housing and construction industry. This includes ensuring access to affordable housing, promoting inclusive and diverse communities, and protecting the rights of construction workers (UN, 2015). For example, the use of participatory design approaches can help ensure that housing developments meet the needs and aspirations of local communities (Kamete, 2017).

Economic sustainability seeks to promote economic growth and development in the housing and construction industry while minimizing environmental degradation and social inequality. This includes investing in

sustainable infrastructure, promoting green jobs, and encouraging sustainable consumption patterns (World Bank, 2019). For instance, the use of green building certifications like LEED and BREEAM can help increase property values and attract investments in sustainable real estate (Dwaikat & Ali, 2018).

In addition to the three dimensions of sustainable development, other key principles relevant to the housing and construction industry include:

Inter-generational equity, emphasizes the need to balance the needs of present and future generations (WCED, 1987). In the housing and construction industry, this principle can be applied by designing buildings and communities that are adaptable, resilient, and sustainable over the long term.

Intra-generational equity promotes social justice and equality within the current generation (UN, 2015). In the housing and construction industry, this principle can be applied by ensuring access to affordable housing, promoting inclusive and diverse communities, and protecting the rights of construction workers.

The precautionary principle, advocates for taking preventive measures to avoid environmental harm, even in the face of scientific uncertainty (Rio Declaration, 1992). In the housing and construction industry, this principle can be applied by adopting sustainable building practices, using environmentally friendly materials, and minimizing waste and pollution.

Participation and inclusivity, emphasize the importance of involving diverse stakeholders in decision-making processes (UN, 2015). In the housing and construction industry, this principle can be applied by using participatory design approaches, engaging with local communities, and promoting collaborative governance.

Examples abound of projects that fail to integrate sustainable housing development principles in Anambra state; The observed failure often relates to abandonment, defects and other non-obvious failures in Amansea, 3 - 3 and other part of the state. The projects that succeed were due to core housing project designs, use of climate resilience construction and locally sourced materials adoption. The integration of sustainable housing must align with the global best practice from material, energy use, waste reduction to water management.

A successful model in Nigeria is the Eco-village project located in Port-harcourt, Rivers state. The project used passive design and modern green technology that used traditional materials for natural ventilation; the Hydraform blocks is also an energy reduction initiative with passive cooling. An actionable framework will require a prolonged approach such as: climate resilience/eco-friendly materials, inclusive finance and sustainable construction.

Barriers to the Application of SD Principles on Housing Projects

When SD and SDGs came on board in 1987 and 2015 respectively, each nation and/or sectors of the economy were expected to translate each relevant SDG into National Plans of Action (Rotimi, 2016). Due to the peculiarities of each nation/sector, the desired results have not been achieved. SDGs/SH/SC requires coordinated monitoring and modelling of many factors which the construction industry (CI) particularly in Developing Nations is struggling to provide due to the dearth of personnel skilled to undertake this task (Rotimi, 2016). To Munyasya & Chileshe (2018) the lack of a steering mechanism, the multidisciplinary nature of the word “sustainability” and “lack of cooperation and networking are part of the problems bedeviling the SC. Iyanda and Olatunji (2024) argue and identify effective stakeholder engagement and partnerships are crucial for the successful implementation of the SDGs, which is lacking in CI, particularly in developing nations. Also, Roderick (2020), argues that instrumental rationalism has been involved in implementing SD and this linear thinking, with little attention attributed to human intentions, motives, preferences, and fundamental values that frame the constitution of societal institutions and structures, as well as individual and collective behaviours is a serious concern in achieving SDGs.

The problems with SDGs implementation in housing are distinct to each locality and nation. In developed countries such as the USA, Karji, Namian & Tafazzoli (2020) argued that the current practice of sustainability in the construction industry is far from reaching the targeted green goals of sustainable development because

of the existence of some of these constraints pre-construction, managerial, legislative, and financial and planning constraints. Also, Zhang et al. (2022) found that high upfront costs and lack of government incentives are significant barriers to the adoption of SD principles in housing projects in the United States. Similarly, Wang et al. (2023); Wilson and Tagara (2006) identified the lack of standardization and certification processes for SD practices as a significant barrier in Australia. In New Zealand, the Lack of effective application of sustainability guidelines, inadequate legislation, and building codes were significant hurdles in implementing sustainable practices in the construction sector (Moshood, Rotimi & Shahzad, 2024). The findings of Wilson & Tagara, (2006) are not different from the findings of Hakkinen & Belloni, 2011; Zhang, Hen & Lee 2012; Wilson and Dair, 2011; Hwang & Tan, 2012; Ametepey & Ansah, 2015; Karji, Nimian & Tafazzoli, 2020 which identifies similar forms of barriers to SD incorporation in housing in respective countries.

In developing countries such as Malaysia, Suliman & Abdelnaser (2009) discovered that lack of awareness, training and education, ineffective procurement systems, and existing public policies and regulatory frameworks are major barriers to sustainable construction. In Palestine and its environs, the results of the study done by Enshass & Mayer, (2005) are the same as the findings of the study done by (Suliman & Abdelnaser, 2009) with the addition of ineffective procurement systems, and existing public policies and regulatory frameworks. In Africa, Kumar, Kumar, Vivekadhish (2016); and Rotimi, (2016) observed that four major challenges that need to be addressed for achieving the SDGs in any sector of the African economy with housing inclusive are financial, maintaining peace, measuring progress and accountability.

In Nigeria, several authors have identified various barriers to applying SD principles in housing project delivery. According to Olanipekun et al. (2020), a lack of awareness and knowledge about SD principles is a significant barrier to their adoption in Nigeria. Similarly, Ehimioh, Obi, Paul & Ejiofor (2024) and Chinyio & Olomolaiye (2020) found that limited awareness and understanding of SD principles among construction professionals in Nigeria hinder the adoption of SD practices; There is a lack of concrete action plans and accountability (Iyanda & Olatunji, 2024) Other authors have also identified additional barriers, including lack of infrastructure and inadequate government policies (Iyanda & Olatunji, 2024; Okorie & Eniola, 2020); limited access to finance and high interest rates (Ametepey & Aigbavboa, 2020); limited availability of sustainable building materials (Nwachukwu & Okolie, 2022); lack of skilled labour and limited training programs (Sanchez et al., 2022); lack of stakeholder engagement (Turay, 2022). Lack of expertise and professional knowledge of SD principles and demand for a strategy to promote sustainable construction (Daniel, Oshineye & Oshodi 2018). Lack of accurate data (Kayode, 2022). The lack of measurement tools to showcase the benefit of sustainable construction practices in Nigeria and the inability to simplify work and tasks as the most significant barriers to sustainable construction practices on construction sites. (Omopariola, Windapo & Albert, 2019). To Iyanda & Oluntuji, (2024) one of the significant gaps in addressing the key challenges of the SDGs in Nigeria is the availability and quality of data. While Baba, Achoba & Otaro (2015), argue that poverty, redundant housing policies and financial bottlenecks, high cost of building materials, lack of financial instruments for building construction projects as well as the palpable lack of innovative building technologies are the key barriers to SDGs in housing. Other include uncontrolled development, poor maintenance culture and social infrastructure, and the cost of restructuring the economy to Green (Uwazie, Igwemma & Okonkwo, 2015)

In summary, these studies on barriers to SDGs implementation in housing as conducted in both developed and developing countries have shown that barriers are somehow similar in some regard and vary across boards/climes.

Identifying Opportunities in Sustainable Principles in Housing Project Delivery in Anambra State

This study after discussing extensively the barriers to implementing SDPs in housing delivery projects, identifies some opportunities that will help reduce these barriers within the study area. Most of these opportunities will emanate from strengthening Government policies and regulations. This can be done by;

1. Professional bodies should update the existing National Building Code to mandate specific sustainable features, such as energy-efficient designs, waste management strategies, introduction of green building incentives etc.

2. The state government could also establish a state-specific green building certification. This can be achieved by providing training, workshops (addressing skill gaps) and certification process that recognizes and rewards sustainable building practices tailored to Anambra state's climate and resources. This would boost the credibility and marketability of green housing projects. Anambra's Environmental Management and Protection Law (2024) can serve as a foundation for stricter environmental impact assessments in housing projects. With the above in place, it is easy to expect the following;

Economic Boost:

Reduced Lifecycle Costs for Occupants: Though initial construction costs may rise, sustainable housing cuts long-term expenses—lower energy bills, reduced water use, and lower maintenance costs.

Access to Green Finance / ESG Funding: Developers can tap into climate finance instruments, green bonds, or donor funding streams targeting sustainable infrastructure and housing in Africa.

Incentives for Developers: Government-backed mortgage guarantees, tax holidays, or rebates for adopting sustainability measures can reduce project risk and boost ROI.

Microfinance for Green Retrofitting: Financial institutions could introduce green home improvement loans for upgrading existing housing stock (e.g. installing solar, insulation, or efficient fixtures).

Public-Private Partnerships (PPPs): Anambra can structure PPP models to co-develop green housing estates (eg: Golf Estate, Awka) leveraging private investment while aligning with public sustainability goals

Job Creation and Local Economic Stimulation: Local production and installation of eco-friendly materials and systems can create employment and drive demand for green skills and **services**.

Improved Social Impact: Create communities that meet the needs of residents and promote social well-being through

Improved Health Outcomes: Better air quality, thermal comfort, daylighting, and use of non-toxic materials contribute to reduced respiratory issues and stress-related illnesses.

Enhanced Quality of Life: **Green** spaces, improved sanitation, walkability, and community-based amenities enhance livability and social well-being.

Environmental Protection: There will be reduced environmental impact through sustainable building practices, environmental awareness and behavioural change. Sustainable housing promotes a culture of resource-conscious living—recycling, energy conservation, and active waste management. In addition to that resilience and safety climate-adaptive housing reduces vulnerability to floods, erosion and other related environmental hazards

METHODOLOGY

The research was structured to effectively identify the barriers influencing applying sustainable development principles in housing project delivery in Anambra State, Nigeria. For this study, a quantitative research approach method was adopted. The research employed a survey design, utilizing structured questionnaires as the primary tool for collecting data in the field. The study area is Anambra State and was delimited to Onitsha, Awka and Nnewi and their environs. The reason is major urban centres that play a pivotal role in the state's governance and development initiatives. The population of this study include fully registered building professionals residing and practising in the study area. The record obtained from their respective secretariat from the study area shows that the population include: Architects (23), Builders (18), Civil/Structural Engineers (25) and Quantity Surveyors (12). The population of each profession were sourced from their respective state secretariat, representing seventy-eight (78) registered professionals in the study area. The study did not involve any sampling techniques because the population was deemed manageable, allowing for data collection from the entire population. Questionnaires were administered to professionals (see Table 1). A total

of seventy-eight (78) questionnaires were distributed, while sixty (62) were returned and found fit for the study which corresponds to 79% returned. The respondents' perspectives on the research questions were utilized to form opinions regarding the extent to which housing projects in Anambra State, Nigeria, incorporate and comply with sustainable development principles.

Analysis of the field data employed descriptive and inferential statistical tools. Particularly, arithmetic mean and standard deviation were used to estimate the behaviour of the data series while the principal component method of Exploratory Factor Analysis (EFA) was utilized in assessing and extracting the key barriers of SD Principles in Housing Project Delivery in Anambra State. The choice of the Principal Component Analysis (PCA) method of EFA was because of its capacity to remove severe autocorrelation from the data series and then, produce stable and reliable orthogonal results which in this case, was used for SD Principles in Housing Project Delivery in Anambra State. The various equations (or models) necessary for the reduction analyses are as follows:

The covariance matrix $\sum$ is specified thus:

$$\sum = \frac{1}{n} \sum_{i=1}^n (A_i - \underline{A}) (A_i - \underline{A})^T \quad (3.1)$$

Where, A_i is the vector of the data series, $\underline{A}$ is the mean vector, T is a transpose operator, and n is the number of observations.

The component scores of the original variables are specified as:

$$CS_{ij} = \sum_{k=1}^n Z_{ik} L_{kl} \quad (3.2)$$

Where CS_{ij} is the score of i^{th} observation in the j^{th} component, Z_{ik} is the standardized value for the j^{th} factor in i^{th} observation, L_{kl} is the loading of factor k on component l , and the summation is overall n variables.

The proportion of variance explained is specified as:

$$PV = \frac{\omega_i}{\sum_{i=1}^t \omega_i} \quad (3.3)$$

Where ω_i the i -th eigenvalue and t is the total number of eigenvalues; hence, the total variance explained which was summed over the k -number of principal components used in reconstructing the data series (k) is given by:

$$TV = \sum_{j=1}^k \left(\frac{\omega_i}{\sum_{i=1}^t \omega_i} \right)_j \quad (3.4)$$

A 1-sample t-test was used to validate the formulated testable hypotheses further.

Statistical Package for Social Sciences (SPSS) version 27.0 was used in analyzing the field data.

RESULT

Table 1: The breakdown of questionnaire distribution

Respondents	No distributed	No returned and validated	% Returned and validated
Professional	78	62	79

Table 2: Barriers to the Application of SD Principles on Housing Projects

BARRIERS	Frequency					Mean	R
	5	4	3	2	1		
Lack of awareness of the benefit of sustainable development.	23	12	0	20	7	3.39	10 th
Lack of training and education.	47	15	0	0	0	4.76	2 nd
Lack of client demand.	24	23	0	0	0	3.42	9 th
Lack of reliable information on the cost savings.	23	25		14		3.92	8 th
Lack of methods that support the adoption of sustainable development in housing projects and construction.	24	15	0	13	0	3.32	12 th
High cost of sustainable housing project.	34	23	0	5	0	4.39	6 th
Shortage of government incentives and high cost.	40	17	0	5	0	4.48	4 th
Resistance to change from current practices.	24	12	0	14	12	3.35	11 th
Lack of demand for strategy by the government to promote the application of SD in housing projects.	38	18	0	6	0	4.42	5 th
Corruption and maladministration.	38	24	0	0	0	4.61	3 rd
Lack of legislation and enforcement and monitoring by government agencies	27	20	0	15	0	3.95	7 th
Challenges of rising poverty in Nigeria.	50	12	0	0	0	4.81	1 st

The result from Table 2 shows the respondents' responses on the barrier to the application of SD principles in housing projects. According to RII their ranking in Table 2, the critical constraints to SDP application in housing are poverty index; lack of training and education; and corruption and maladministration with RII scores of 4.81, 4.76 and 4.61 respectively. The least barriers from the RII evaluation in Table 2 are lack of legislation; enforcement and monitoring by government agencies; and lack of reliable information on cost savings. Also, the results in Table 2 reaffirm the findings of the study carried out by (Enshass and Mayer, 2005; Shaffi, et al., 2006; Abidin, et al., 2013; Daniel, et al, 2018; Munyasya and Chileshe, 2018). The issue of rising poverty in Nigeria (4.81) and Lack of training and education (4.76) further aligned with the major findings of Enhass and Mayer, (2005); Shafii, (2006); Suleman and Abdalnaser, (2009). Also, Corruption and maladministration (4.61), Shortage of government incentives and high cost (4.48) substantiate the findings of Wilson and Tagara, 2006; Wilson and Dair, 2007.

Table 3: Variable Labels and Coding

Variable Labels	Variable Codes
Lack of awareness of the benefit of sustainable development.	SDB ₁
Lack of training and education.	SDB ₂
Lack of client demand.	SDB ₃
Lack of reliable information on the cost savings.	SDB ₄
Lack of method that supports adopting sustainable development in housing projects and construction.	SDB ₅
High cost of sustainable housing project.	SDB ₆

Shortage of government incentives and high cost.	SDB ₇
Resistance to change from current practices.	SDB ₈
Lack of demand for strategy by the government to promote the application of SD in housing projects.	SDB ₉
Corruption and maladministration.	SDB ₁₀
Lack of legislation and enforcement and monitoring by government agencies	SDB ₁₁
Challenges of rising poverty in Nigeria.	SDB ₁₂

Table 4:Descriptive and Correlation Matrix

Variabl es	MEAN±ST D.	SDB 1	SDB 2	SDB 3	SDB 4	SDB 5	SDB 6	SDB 7	SDB 8	SDB 9	SDB 10	SDB 11	SDB 12
SDB ₁	3.39±1.530	1.00 0											
SDB ₂	4.76±0.432	.455	1.00 0										
SDB ₃	4.51±0.505	- .218	.770	1.00 0									
SDB ₄	3.92±1.135	- .415	.621	.978	1.00 0								
SDB ₅	3.96±1.220	.580	.989	.668	.500	1.00 0							
SDB ₆	4.39±0.856	.128	.941	.940	.849	.882	1.00 0						
SDB ₇	4.48±0.864	.432	1.00 0	.786	.641	.985	.950	1.00 0					
SDB ₈	3.35±1.631	.812	.890	.393	.195	.947	.684	.877	1.00 0				
SDB ₉	4.42±0.915	.399	.998	.808	.669	.978	.961	.999	.860	1.00 0			
SDB ₁₀	4.61±0.491	.116	.937	.944	.855	.876	1.00 0	.946	.674	.957	1.00 0		
SDB ₁₁	3.95±1.193	.355	.994	.835	.703	.967	.973	.997	.834	.999	.970	1.00 0	
SDB ₁₂	4.81±0.398	.530	.996	.712	.551	.998	.909	.994	.926	.989	.904	.981	1.00 0

This matrix is not positive definite.

The Pearson correlation analysis indicates that the variables are highly correlated among themselves. This confirms the appropriateness of the factor analysis technique to maximize the sum of squared loadings of each factor extracted in turn. The researcher also conducted the Kaiser-Meyer-Oilkin (KMO) and Bartlett's Test to ascertain the sample adequacy as well as the dependence of the large bodies of factors and collapse them into significant and orthogonal components that better explain the system. See the KMO and Bartlett's Test Results in Table 5.

Table 5: KMO and Bartlett's test of Sphericity

Kaiser-Meyer-Olkin (KMO) test		0.832>0.500
Bartlett's Test of Sphericity	Approx. Chi-Square	132.07 [p=0.013<0.05]

In Table 5, the KMO estimated value of 0.832 surpasses the recommended threshold of 0.50, thereby providing

crucial insights into the suitability and significance of Principal Component Analysis (PCA) on the data series. However, Bartlett's test of sphericity with an approximate Chi-Square value of 132.07 and associated probability value of $0.013 < 0.05$ shows that the variables are significantly dependent (or correlated) which therefore welcomes the conduct of Principal Component Analysis. It also buttresses the idea that the dataset exhibits sufficient commonality to support PCA. Proceeding with the PCA, the variables were coded as presented in Table 6.

Table 6: Component Score Matrix

Variable Codes	Components		Communalities
	I	II	
SDB ₁	.361	.933	1.000
SDB ₂	.995	.104	1.000
SDB ₃	.832	-.555	1.000
SDB ₄	.699	-.715	1.000
SDB ₅	.969	.248	1.000
SDB ₆	.971	-.238	1.000
SDB ₇	.997	.078	1.000
SDB ₈	.838	.546	1.000
SDB ₉	.999	.041	1.000
SDB ₁₀	.968	-.250	1.000
SDB ₁₁	1.000	-.006	1.000
SDB ₁₂	.982	.189	1.000
Eigenvalue	9.78	2.22	
%Age of variance	81.48%	18.52%	
Cum %age	81.48%	100.00%	

The principal component (PC) result shows the barriers that hold substantial significance to the application of Sustainable Development (SD) Principles in Housing Project Delivery in Anambra State. The communalities as shown in the result provided that the factors (barriers) were highly loaded without leaving anything after their representation. The extracted factors are: Lack of legislation and enforcement and monitoring by government agencies (SDB₁₁) from Component 1 and Lack of awareness of the benefit of sustainable development (SDB₁) from Component II. These extracted orthogonal components have eigenvalues of 9.78 and 2.22 with explained variances of 81.48% and 18.52% respectively. Jointly, the two factors: SDB₁₁ and SDB₁ account for entire variations in the system.

H1: The barriers do not significantly influence the extent of the application of Sustainable Development (SD) Principles in Housing Project Delivery in Anambra State.

Likert mean[STD] = 3.00[1.592]

Survey mean[STD] = 4.21[0.494]

N = 12

t-statistic = 8.497

probability value = 0.000 < 0.05

95% C.I. = 0.8984 to 1.5266

Decision rule: Reject the null hypothesis if $p \leq 0.05$; otherwise, do not reject.

Conclusion

The barriers exerted a significant effect on the application of Sustainable Development (SD) Principles in Housing Project Delivery in Anambra State.

CONCLUSION

This study examines the barriers to SDP application in housing project delivery in Anambra state, Nigeria. The study barriers to SDP application to housing in the study area are multi-faceted and significantly affect the application of SDP in Housing Project Delivery. Furthermore, the study revealed the key barriers to SDP application in housing to be the lack of legislation/enforcement/monitoring by government agencies and awareness of the benefits of sustainable development. Hence, it's pertinent that addressing these concerns requires an integrative approach that will involve all the key stakeholders in the construction industry with appropriate legislation and legal backing. Also, this approach or framework developed should be religiously enforced and monitored with appropriate education and training on the importance and needs of SD in the study area.

REFERENCES

1. Abubakar, I. R. (2017). Access to sanitation facilities among Nigerian households: Determinants and sustainability implications. College of Architecture and Planning, University of Dammam, Saudi Arabia; Sustainability, 9(4), 547. doi:10.3390/su9040547
2. Adequate, O. (2017). An assessment of the National Housing Policy in Nigeria. Journal of Housing and the Built Environment, 32(2), 257-271.
3. Agbola, S. B., & Olatubara, C. O. (2012). An evaluation of the National Housing Policy in Nigeria. Journal of Environmental and Urban Studies, 1(1), 1-12.
4. Ajala S. (2022), Can SDGs be Achieved in Nigeria before 2030? According to Data, not Likely, Reading Times, Available online: <https://dataphyte.com/latest-reports/development/can-sdgs-be-achieved-in-nigeria-before-2030-according-to-data-not-likely/> accessed on 21/03/2025
5. Alitaeia, Capital (2010) "Challenges and Benefits of "Going Green" In Nigeria". Lagos, www.Alitaeiacapital.com.
6. Ametepey, C. O., & Aigbavboa, C. O. (2020). Drivers of sustainable development in the Ghanaian construction industry. Journal of Engineering, Design and Technology, 18(4), 532-545.
7. Ametepey, C and Ansah, K. (2015). Barriers to successful implementation of sustainable construction in the Ghanaian construction industry. Procedia manufacturing, 3, 16682-16689.
8. Ajala S (2022) Can SDGs be Achieved in Nigeria before 2030? According to Data, not Likely. Available via DIALOG. <https://www.datatype.com/latest-reports/sdgsfcb/can-sdgs-be-achieved-in-nigeria-before-2030-according-to-data-not-likely/>. Accessed March 18, 2025

9. Baba, N.A, Achoba, I.M and Otaro, T.O. (2015). Evaluating the prospect and challenges of sustainable housing on national development in Nigeria. *International Journal of Scientific Research, Engineering and Technology*, 1(5): 435-441.
10. Cerin, P. (2016). Bringing economic opportunity into line with environmental influence: A discussion on the Coase theorem and the Porter and van der Linde hypothesis. *Ecological Economics*, 56, 209–225. doi: 10.1016/j.ecolecon.2005.01.016
11. Chinyio, E. A., & Olomolaiye, P. O. (2020). Barriers to sustainable construction in Nigeria. *Journal of Construction in Developing Countries*, 25(1), 1-18.
12. Daniel, E I, Oshineye, O and Oshodi, O (2018) Barriers to Sustainable Construction Practice in Nigeria In: Gorse, C and Neilson, C J (Eds) *Proceeding of the 34th Annual ARCOM Conference*, 3-5 September 2018, Belfast, UK, Association of Researchers in Construction Management, 149-158.
13. Dwaikat, L. N., & Ali, K. N. (2018). The impact of green building certification on property values. *Journal of Green Building*, 13(2), 1-13.
14. Ehimioboh, C. O, Obi, N. U, Paul, O & Ejiofor, F (2024). Awareness of the Concept of Sustainable Development Principles among Building Construction Professionals in Asaba, Nigeria. *Global Journal of Environmental Science and Sustainability GJESS*, 1(1), 20-28.
15. Ehimioboh, C. O. (2022). Evaluation of housing project compliance to sustainable development principles in Anambra State, Nigeria. (Unpublished) Master's Thesis, Nnamdi Azikiwe University, Awka, Nigeria.
16. Ejiohu O. A., Ejike R.D. & Ohazurike E. (2024), Nigeria's Implementation of the Sustainable Development Goals, *Qeios*, CC-BY 4.0, <https://doi.org/10.32388/R5I131>
17. Ekere M.E. (2023), A Mid-Term Review of Nigeria's Progress Towards Achieving the Sustainable Development Goals, *AKSU Journal of Administration and Corporate Governance*, 3(3), 35-47, <https://doi.org/10.61090/aksujacog.2023.018>
18. Elkington, J. (1994). Towards the sustainable corporation: Win-win-win business strategies for sustainable development. *California Management Review*, 36(2), 90-100.
19. Enshassi, A. and Mayor, E.P. (2005). Barriers to the application of sustainable concept in Palestine. The 2005 World Sustainable Building Conference, Tokyo, 27-29 September (SBO5 Tokyo) 4624-4628.
20. Ezeokoli, F.I, Okoye, P.U, Ehimioboh, C.O., & Ekekezie C.U. (2022), Construction Stakeholder's Perception on Sustainable Housing Development in Anambra State, Nigeria. *European Journal of Sustainable Development Research*, 6(1), <https://doi.org/10.21601/ejosdr/xxxx>
21. Ezeokoli F.O., Ehimioboh C.O., Iheama N.B. Enebe E.C. (2025) Federal Government of Nigeria (2017). National Housing Policy Review Report.
22. Gossling-Goldsmiths, J. (2018). Sustainable development goals and uncertainty visualization. Published Thesis submitted to the Faculty of Geo-Information Science and Earth Observation of the University of Twente in partial fulfilment of the requirements for the degree of Master of Science in Cartography.
23. Gilkinson, N., & Sexton, M. (2007). Delivering sustainable homes; meeting requirement: A research agenda. In *Proceedings of the XXXVIAHS World Congress in Housing Science*.
24. Håkkinen, T and Bellani, k (2011). Barriers and drivers for sustainable building. *Journal of Building Research and Information*, 39(3), 239-255.
25. Hwang, Y.U & Tan, T.W.(2012). Sustainable Construction in Asian Perspective. Georgia Technology Research Institute, USA.
26. Intergovernmental Panel on Climate Change (IPCC) (2014). Climate change 2014: Mitigation of climate change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.
27. Iurevna K.U., Anuradha K., Prasad R., Gandhi A., Kalele G. & Pawaiya A. (2024) Incorporating Sustainable Development Goals (SDGs) into Building Environment-Related Business Models: A Comprehensive Review, *Euro-Asian Conference on Sustainable Nanotechnology, Environment, & Energy (SNE2-2024)*, Sustainability, Vol. 588, Available online: <https://doi.org/10.1051/e3sconf/202458801005>
28. Iyanda, K.M. & Olatunji R.W. (2024), Analyzing Barriers to Sustainable Development Goal Implementation in Nigeria: A Multidimensional Assessment of Challenges and Opportunities, *Int. j. adv. multidisc. res. stud.* 2024; 4(5):431-436. Available online: <http://www.multiresearchjournal.com/>

29. Jiboye, A.D. (2009). The Challenges of Sustainable Housing and Development in Nigeria. *Journal of Environment Research and Policies*, 4 (3) pp. 23-27.
30. Kamete, A. Y. (2017). Participatory design approaches in housing development: A review of the literature. *Journal of Housing and the Built Environment*, 32(2), 257-271.
31. Karji, A, Namian, M and Tafazzoli, M. (2020). Identifying the key barriers to promoting sustainable construction in the United States: A principal component analysis. *Journal of Sustainability*, 12(5088) www.dpi.com/journal/sustainability
32. Kayode, Asaju. "Achieving the Sustainable Development Goals (SDGs) and the Intricacies and Dynamics of Development Administration"(2022) 2:2 *Contemporary Sociological Issues* 173-189.
33. Khizar H.M.U, Younas A, Kumar S., Akbar A., and Poulouva P., (2023) *Journal of Innovation and Knowledge* 8, (2023), The progression of sustainable development goals in tourism: A systematic literature review of past achievements and future promises, *Journal of Innovation & Knowledge*, 8,100442, <https://doi.org/10.1016/j.jik.2023.100442>
34. Kumar S, Kumar N, Vivekadhish S. Millennium Development Goals (MDGs) to Sustainable Development Goals Unfinished Agenda (SDGs): and Addressing Strengthening Sustainable Development and Partnership. *Indian Journal of Community Medicine : Official Publication of Indian Association of Preventive & Social Medicine*. 2016;41(1):1-4. doi:10.4103/0970-0218.170955.
35. Leibrock C.A. & Harris D.D. (2011), *Design Details for Health, Making the Most of Design's Healing Potential*, Wiley, Hardcover, California.
36. Mensah, J. (2019). Sustainable Development: Meaning, History, Principles, Pillars, and Implications for Human Action: Literature Review. *Cogent Social Sciences*, 5, Article ID: 1653531, <https://doi.org/10.1080/23311886.2019.1653531>
37. Moshood T.D., Rotimi J.O.B., and Shahzad W.(2024), Enhancing sustainability considerations in construction industry projects, *Environment, Development and Sustainability* <https://doi.org/10.1007/s10668-024-04946-2>
38. Munyasya, M.B and Chileshe, N. (2018). Towards sustainable infrastructure development: Drivers, barriers, strategies and coping mechanisms. *Journal of sustainability*, 2018,10,4341; doi,10.3390/su10/24341
39. Njoku, C. (2016). Awareness of climate and sustainability development issues among junior secondary school (JSS) students in Port Harcourt metropolis of River State, Nigeria. *International Journal of Curriculum and Instruction*, 8(2), 29 – 40.
40. Nwachukwu, C. E., & Okolie, K. A. (2022). Awareness and education as drivers of sustainable development in the Anambra state construction industry. *Journal of Sustainable Development*, 15(2), 1-12.
41. Office of the Senior Special Assistant to the President on Sustainable Development Goals (2017): Our mandate. <http://sdgs.gov.ng/about-sdgs/our-mandate>.
42. Okorie, A. V., & Eniola, A. O. (2020). Barriers to sustainable development in the Anambra state construction industry. *Journal of Construction Business and Management*, 4(1), 1-10.
43. Ogu, V. I. (2005). The challenges of implementing the National Housing Policy in Nigeria. *Journal of Housing and the Built Environment*, 20(2), 147-158.
44. Olanipekun, A. O., et al. (2020). Barriers to sustainable development in the Nigerian construction industry. *Journal of Building Construction and Planning Research*, 8(1), 1-12.
45. Omopariola E.D., Albert I., & Windapo A.O. (2019), Key drivers of construction cost underruns and overruns during the project life cycle in South Africa, *Construction Business & Project Management Conference*, Available online: https://www.researchgate.net/publication/371037984_Key_drivers_of_construction_cost_underruns_and_overruns_during_the_project_life_cycle_in_South_Africa
46. Oweibia M, Elemuwa UG, Akpan E et al. (2024), Analyzing Nigeria's Journey Towards Sustainable Development Goals: A Comprehensive Review From Inception To Present [version 1; peer review: awaiting peer review] *F1000Research* 2024, 13 :984 <https://doi.org/10.12688/f1000research.148020.1> First published: 30 Aug 2024, 13:984 <https://doi.org/10.12688/f1000research.148020.1>
47. Rio Declaration on Environment and Development (1992). United Nations Conference on Environment and Development

48. Roderick J. L. (2020), Overcoming Barriers to Implementing Sustainable Development Goals: Human Ecology Matters, *Human Ecology Review*, 26 (1); 95-116.
49. Rotimi S. (2016), The Challenge of Implementing the Sustainable Development Goals in Africa: The Way Forward, *African Journal of Reproductive Health*, (Special Edition on SDGs); 20(3): 13 -18.
50. Sachs J, Traub-Schmidt G, Kroll C, Lafortune G, Fuller G, Woelem F (2021) Sustainable Development Report 2021. <https://www.sustainabledevelopment.report/>. Accessed March 18, 2025.
51. Sachs, J.D., Lafortune, G., Fuller, G. (2024). The SDGs and the UN Summit of the Future. Sustainable Development Report 2024. Paris: SDSN, Dublin: Dublin University Press. 10.25546/108572
52. Shahmohammad M, Salamattalab M.M., Sohn W, Kouhizadeh M, and Aghamohmmadi N, (2024), Opportunities and obstacles of blockchain use in pursuit of sustainable development goal 11: A systematic scoping review, *Sustainable Cities and Society*, 112, <https://doi.org/10.1016/j.scs.2024.105620>
53. Shafii, F., Ali, A.Z & Othman, Z.M (2006). Achieving sustainable construction in the developing countries of South East Asia. *Proceedings of the 6th Asia-Pacific Structural Engineering and Construction Conference (APSEC 2006)*, 5-6 September 2006, Kuala Lumpur, Malaysia.
54. Singh, A., Venkatesh, G., & Jönsson, D. (2019). Life cycle assessment of bamboo buildings: A systematic review. *Journal of Cleaner Production*, 235, 1228-1238.
55. Sorooshian S. (2024) The sustainable development goals of the United Nations: A comparative midterm research review; *Journal of Cleaner Production* 453, 142272, <https://doi.org/10.1016/j.jclepro.2024.142272>
56. Srivastava S, Iyer-Raniga U, and Misra S, (2024), Integrated approach for sustainability assessment and reporting for civil infrastructures projects: Delivering the UN SDGs, *Journal of Cleaner Production* 459, Available online: <https://doi.org/10.1016/j.jclepro.2024.142400>
57. Suliman, L and Omran, A. (2009). Sustainable development and construction industry in Malaysia. *Journal of Economics, Social, Political and Cultural Problems of the Future*, 10, 76-85.
58. Turay N.M. (2022), Barriers to the Implementation of Effective Sustainable Barriers to the Implementation of Effective Sustainable Development Plans in Sierra Leone: Stakeholders' Perspectives Development Plans in Sierra Leone: Stakeholders' Perspectives, Published PhD dissertation, Walden University, Available online: https://scholarworks.waldenu.edu/dissertations?utm_source=scholarworks.waldenu.edu%2Fdissertations%2F13854&utm_medium=PDF&utm_campaign=PDFCoverPages
59. Turcotte, D and Geiser, K (2010). A Framework to Guide Sustainable Housing and Society. 37(2)87-117
60. Ukoha, O. O., & Beamish, C. A. (2017). Rethinking the National Housing Policy in Nigeria: A qualitative approach. *Journal of Housing and the Built Environment*, 32(3), 439-453.
61. Wang, Y., et al. (2023). Barriers to sustainable development in the Australian construction industry. *Journal of Cleaner Production*, 392, 135632.
62. Wilson, K and Dair, C. (2007). A framework for assessing the sustainability of Brownfield Development. *Journal of Planning and Management*, 50(1), 23-640
63. Wilson, J.L and Tagara, E. (2006). Green building in Australia: Drivers and barriers. *Australia Journal of Structural Engineering*, 7(1): 57-63.
64. World Bank (2019). World development report 2019: The changing nature of work.
65. World Commission on Environment and Development (WCED), (1987). Our common future. Oxford, United Kingdom, <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>
66. United Nations (UN) (2015). Transforming our world: The 2030 Agenda for Sustainable Development.
67. United Nations Human Settlements Programme (UN-Habitat), (2015), Un-Habitat Global Activities Report 2015, Increasing Synergy for Greater National Ownership, Nairobi GPO KENYA, <http://www.unhabitat.org/>
68. United Nations Human Settlements Programme (UN-Habitat), (2021), Un-Habitat, For better Urban Future, Nairobi GPO KENYA, <http://www.unhabitat.org/>
69. Uwazie I.U., Igwemma A.A. & Okonkwo O.N. (2015), Sustainable Development in the Nigerian Housing Sector: Challenges and Opportunities of Achieving the Green Initiative, *International Journal of African and Asian Studies*, 12(1), 41-49, Available online: <http://www.iiste.org/>

-
70. Zhai, T. T. and Chang, Y. C. (2019). The standing of environmental public-interest litigants in China: Evolution, obstacles and solutions. *Journal of Environmental Law*, 4(30): 369–397 doi:10.1093/jel/eqy011.
 71. Zhang, J., et al. (2022). Barriers to sustainable development in the US construction industry. *Journal of Building Construction and Planning Research*, 10(3), 1-12.
 72. Zhang, X., Hen, L., Tam, V.W.Y. & Lee, W.W.Y (2012). Barriers to implementing extensive green roof systems: A Hong Kong study. *Renewable and Sustainable Energy Reviews*, 16, 314-319.