POLICY GAPS, INSTITUTIONAL BARRIERS, AND THE ROLE OF BUILDERS IN SUSTAINABLE CONSTRUCTION PRACTICES IN ENUGU STATE, NIGERIA.

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Abstract
The shift towards sustainable construction has become imperative for addressing environmental degradation, resource depletion, and climate change; however, weak policy implementation and institutional constraints continue to hinder its adoption in developing countries, Nigeria inclusive. This study examined the policy gaps, institutional barriers, and builders' professional roles in influencing sustainable construction practices in Enugu State, Nigeria, by assessing existing policy deficiencies, identifying institutional barriers, evaluating builders' contributions to sustainable construction, and examining variations in professionals' perceptions. A quantitative cross-sectional survey design was adopted. Data were collected from 244 construction professionals and regulatory officials selected through stratified random sampling from a target population of 775. Questionnaire data were analysed using mean ranking and the Kruskal-Wallis H test. The findings revealed that existing policy frameworks inadequately support sustainable construction, with non-domestication of the Nigerian National Building Code, weak enforcement of building regulations, limited incentives for green buildings, and insufficient policy support for sustainable innovation identified as the most critical gaps. Institutional barriers, particularly limited regulatory capacity, bureaucratic approval processes, poor inter-agency collaboration, and political interference, significantly constrained sustainable construction practices. Also, respondents demonstrated a shared perception of builders' critical roles in quality assurance, material waste reduction, health and safety enforcement, and sustainable project delivery. The study concludes that strengthening regulatory frameworks, enhancing institutional capacity, promoting inter-agency collaboration, and providing incentives for green construction are essential to advancing sustainable construction practices in Enugu State, Nigeria, and some recommendations based on the findings were made in the paper.

Keywords: Sustainable Construction Practices, Policy Gaps, Institutional Barriers, Builders' Professional Roles, Enugu State, Nigeria

1. Introduction
The building construction industry is an essential engine room for infrastructural development, and urban transformation. The industry is a complex and diverse sector that employs a wide range of stakeholders, materials, labour and equipment to achieve a built-environment. It is made up of the Town Planners, Land Surveyors, Architects, Builders, Engineers, Quantity Surveyors as well as support groups (public administrators, developers, and financial institutions) (Ogunsemi, 2002). The built environment consists of human-made spaces designed for daily living, working, and recreational activities. It impacts the environment and how the society functions. Luteranya (2021) defined the built environment as human-made surroundings that provides the settings for human activity, ranging from buildings and parks or green spaces to neighborhoods and cities that can often include their supporting infrastructure such as water supply and energy networks.

Driven by a surge in real estate investment, commercial projects, and rapid urban migration, Enugu metropolis is experiencing rapid and extensive infrastructural growth (Okeke et. al., 2021), and the state's-built environment is expanding at an unprecedented rate (Mba et al., 2024). However, this rapid growth presents some major challenges. The structural integrity, safety, and long-term viability of these emerging projects are frequently compromised by systemic policies and regulatory failures, bureaucratic delays, and

a severe shortage of professional oversight (Okeke et al., 2020). The preservation of our built environment cannot be over-emphasized, and Government policies on building regulations, approval processes, supervisions and enforcement are of paramount importance to eliminate unhealthy practices and to build a sustainable environment. It is important to note that the town planning authorities of each state in Nigeria are charged with the responsibilities of certifying and approving building drawings, and they derived their powers from the Nigerian Urban and Regional Planning (NURP) Law (decree 88 of 1992) and the National Urban Development Policy (2006). The Law allows for decentralization of physical planning and control activities through the establishment of institutions at the three tiers of government. This constitutional provision has raised a very pertinent question as to how every state government policy affects a sustainable built environment, from the planning approval authority to supervision and enforcement of building procurement processes, Enugu State inclusive. Since building construction processes involve several stages, from the pre-design stage to design, approval, construction and post construction stages (Fowode, 2016), and errors in any of the stages before the post construction stage can contribute to the quality of the final product, it has become imperative to transit from the conventional building methods to a sustainable construction practice to reduce waste, improve long-term resource efficiency, and minimize environmental degradation (Ejiofor, 2023). This paper therefore, evaluates the policy gaps in the construction frameworks, the institutional barriers, and the Builders roles in sustainable construction practices in Enugu State, Nigeria.

1.1. Research Hypotheses

Ho_1: There is no significant difference in the perceptions of institutional barriers to sustainable construction practices among construction professionals in Enugu State, based on their profession.

Ho_2: There is no significant difference in the perceptions of Builders' roles in promoting sustainable construction practices among construction professionals in Enugu State, based on their profession.

2. The Building Approval Process in Enugu State

The building plan approval process in Enugu State is divided in two based on geography and jurisdiction, driving different layers of institutional friction: The Regulatory agency for developments within the capital metropolis—encompassing Enugu North, Enugu East, and Enugu South Local Government Area is the Enugu Capital Territory Development Authority (ECTDA), while for developments outside these three-core urban areas, plans are processed through the respective local Town Planning Authorities. A key systemic constraint is the mandatory policy linking physical planning to land administration. No building plan approval is granted without a validly registered land title, such as a Certificate of Occupancy (C of O) or a Registered Deed of Assignment. This requirement often causes severe project delays, prompting some developers to construct unapproved buildings. Historically, the administration of land titles and building approvals operated in separate administrative silos. To secure an approval for building construction in Enugu State, a developer must submit; 4 sets of drawings (architectural, structural, mechanical, and electrical drawings), 1 copy of survey plan, evidence of registered land title, site analysis report, environmental impact assessment (EIA) for commercial or large-scale projects and a proof of 3 years tax clearance certificate.

2.1. Policy Gaps

The foundational challenges facing construction practices in Enugu State stem from an outdated legal and regulatory framework that fails to address the complexities of modern urban development. The legal and regulatory framework is anchored in the conventional methodology, leaving modern eco-friendly initiatives largely unsupported.

2.1.1. Outdated Building Regulation and Non-Domestication/Enforcement of the Nigerian National Building Code (2006)

The primary policy failure stems from the building regulations that do not align with the modern sustainability benchmarks (Mba, 2025). The existing regulations lack clear mandates for a sustainable

environment with a low-carbon and climate-responsive housing strategies such as thermal mass insulation or specific energy-efficiency performance metrics (Alegbe, 2025). It focused primarily on spatial zoning, and declaring multiple local government areas as unified urban planning zones (Okeke et al., 2020; Businessday, 2026). The Nigeria National Building Code (2006) is a homegrown building regulation that spells out the legal requirements, and represents the minimum acceptable standards for the regulation of the design, approval processes, construction and post construction processes of buildings in Nigeria, with a view to protecting the general interest of the end users of such buildings and creating a sustainable built environment; the basic aim is to assure quality and safeguard the health, safety and general welfare of those who will ultimately use such buildings (Igboko et al., 2023). Its legal domestication and enforcement in Enugu State remain incredibly weak (Centre for Climate Change & Development (CCCD), 2021).

2.1.2. The Sustainability Disconnect

The structural problem within this process is that the vetting and approval processes at the ECTDA and the Local Government Town Planning Authorities excluded other important built environment professionals, focus exclusively on zoning, land use, structural stability, and dimensional setbacks. The vetting guidelines lack explicit metrics or checkboxes for buildability and maintainability analysis, and other green design elements such as passive cooling performance, waste water recycling systems, or low energy material selections. Hence, developers can secure approval for a building project that is entirely unsustainable, and poorly insulated against the humid tropical climate in Enugu State.

2.1.3. Weak Frameworks for Local Materials

Current frameworks fail to offer standardized testing, quality benchmarks, or guidelines for utilizing raw earth systems or locally sourced, low energy materials (Alegbe, 2025; Chukwu et al., 2019). Without a regulatory policy to validate these alternative materials, developers will always fall back to traditional carbon-intensive concrete.

2.2. Institutional Barriers and Bureaucratic Hurdles

A major institutional breakdown exists within the town planning authorities and the development control boards. These planning authorities in Enugu State face severe human resource shortages. They lack diverse registered professional expertise—such as the Architects, Builders, Engineers, Surveyors, etc., needed to effectively analyze, vet, and monitor advanced eco-friendly designs, leaving the boards predominantly staffed by Town Planners. This results in the routine approval of technically deficient or unsustainable drawings (Okereke et al., 2024). The baseline process to obtain approval for building construction project is very slow and rigorous. This is because formal approvals are tied to lengthy and expensive land-titling processes at the Enugu State Geographical Information System (ENGIS), so clients frequently bypass construction professionals to hire uncertified quacks to erect buildings without any regulatory oversight. This results in buildings that violate basic environmental safety, land-use zoning, and climate resilience standards. In outer sub-urban, informal land subdivisions and illegal construction projects are common, often resulting in buildings that violate basic setbacks, public utility lines, and natural drainage channels (Anya, 2024; Okereke et al., 2024).

2.3. Builders Roles and Barriers in Sustainability

Professional Builders serve as the critical operational anchor on the construction site, they manage the physical assembly of any building project, minimize waste, upskill workforce, and handle the strategic leadership on-site. They ensure that the construction site operates cleanly, and artisans execute advanced sustainable details (like installing permeable pavements or handling green roofing systems). While Architects handle conceptual aesthetics and Engineers calculate load specifications, the Builder is legally responsible for managing the physical construction process, ensuring structural integrity, and executing quality control protocols.

To mitigate Enugu's humid tropical climate, Builders must execute practical design modifications that optimize building envelopes. These techniques directly counter urban heat and eliminate dependency

on heavy, artificial cooling. Table 1 present the sustainable strategies for construction: practical applications and associated environmental benefits.

Table 1: Sustainable Strategies for Construction: Practical Applications and Environmental Benefits.

Sustainable Strategy	Practical Construction Application	Environmental Benefit
Climate-Responsive Design	Strategic orientation of windows, integration of solar shading, and deep overhangs.	Maximizes natural ventilation and light; significantly lowers indoor thermal discomfort.
Resource Efficiency	Installation of low-flow water plumbing fixtures, waste-water recycling, and smart lighting systems.	Minimizes water waste and significantly reduces operational utility costs.
Eco-Friendly Materials	Utilizing locally sourced, renewable, or reclaimed materials (e.g., natural fiber, reclaimed timber).	Lowers the building's overall carbon footprint by cutting down transport and production of emission.
Hydrological Systems	Laying permeable pavements, installing green roofs, and integrating rainwater harvesting traps.	Manages heavy stormwater runoff, mitigates local flooding, and eases pressure on municipal drainage systems.

Source: Amasuomo, (2021); Mba et al., (2024).

Builders translate theoretical designs into physical structures while strictly managing material specifications and site safety. Table 2 present some of the Builders roles and the structural quality outcome in building construction phases.

Table 2: Builders Roles and the Structural Quality Outcome in Building Construction Phases

Construction Phase	Builder's Roles	Structural Outcome
Material Quality Assurance	Conducting mandatory on-site slump tests, concrete cube crushing evaluations, and reinforcing steel tensile strength verifications.	Eliminates the use of substandard concrete blends and weak steel components, directly preventing premature building collapse.
Buildability and Maintainability Vetting	Reviewing structural, architectural, mechanical and electrical drawings to evaluate construction practicability before moving to the site.	Detects design discrepancies early, preventing errors during construction and minimizing costly structural corrections.
Site Operations & Safety	Managing construction artisans on site, implementing strict scaffolding protocols, managing site layouts, and ensuring the correct use of Personal Protective Equipment (PPE).	Specified quality is achieved, lowers operational accident rates and keeps site work aligned with international safety and quality standards (ISO 9001).
Subsoil & Foundation Match	Verifying that on-site foundation excavations accurately match the soil bearing capacities specified in geotechnical reports.	Prevents differential building settlement, structural cracking, and foundation failures caused by challenging soil profiles.

Source: Hilary et al., (2020); Ezeokoli et al., (2024).

2.3.1. Enforcing Quality Management Principles

Builders are essential for implementing organized quality management policies on-site, by moving away from the informal and ad-hoc construction methods. They embed structured quality checks into every phase of a project. This structural management approach focuses on continuous inspection, accurate material

accounting, and precise assembly, which helps reduce the high rates of structural non-compliance often seen in projects managed by untrained personnel (Ezeokoli et al., 2024; Hilary et al., 2020).

2.3.2. Mitigating Material Waste and Substandard Quackery

A major vulnerability in Enugu's construction landscape is the high level of material waste and the frequent involvement of uncertified individuals, referred to as "quacks" (Hilary et al., 2020). Builders address these challenges by introducing strict structural auditing protocols on-site. Through precise material tracking, correct mix proportions, and close supervision of site artisans. They minimize material waste, lower overall project lifecycle costs, and ensure that structures are built in strict compliance with engineering specifications (Ezeokoli et al., 2024; Hilary et al., 2020).

2.3.3. Managing the Artisan Skill Gap

The successful execution of any construction project relies ultimately on the technical skills of the artisans, including masons, carpenters, iron-fixers, and plumbers. However, the informal labour pool in Enugu State often lacks formal training in modern high-precision building techniques (Hilary et al., 2020). Registered Builders fill this gap by organizing structured on-site training sessions by supervising critical tasks such as the accurate bending of steel reinforcement bars or the precise mixing of structural concrete. Builders upgrade the skills of the construction workforce, ensuring high-quality and long-lasting project delivery (Ezeokoli et al., 2024; Hilary et al., 2020).

3. Methods and Data Used

The study was conducted in Enugu State, Nigeria. A quantitative cross-sectional survey was employed and the population of this study comprises the distinct registered professionals involved in sustainable construction practices, namely the Builders, Architects, Quantity Surveyors, Engineers (structural, mechanical and electrical), Town Planners, and the officials of the Enugu Capital Territory Development Authority (ECTDA). Given the relatively small population of the study as retrieved from each professional's secretariat register and the Enugu Capital Territory Development Authority (ECTDA), a stratified random sampling technique was adopted. The required sample size for each stratum was determined using proportionate allocation, and the respondents were selected through a simple random sampling technique. Table 3 presents the population, population size, and Proportional allocation of the Sample size.

Table 3: Population, Population Size, and Proportional Allocation of the Sample Size.

Population Group	Population (N)	Percentage (%)	Sample Allocation (n = 247)
Builders (CORBON)	95	7.3	18
Architects (ARCON)	93	11.0	27
Quantity Surveyors (QSRBN)	90	7.7	19
Engineers (COREN)	137	20.7	51
Town Planners (TOPREC)	210	22.6	56
Officials of ECTDA	150	30.7	76
Total	**775**	**100.0**	**247**

4. Data Analysis and Results

The data collected from the administered questionnaires were coded and analysed using the Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics, specifically the Mean, were employed to determine the average ratings of respondents on the identified policy gaps, institutional barriers, and builders' roles in promoting sustainable construction practices. The mean scores facilitated the ranking and interpretation of the respondents' perceptions of each variable.

To test the study hypotheses, Kruskal-Wallis H test, a non-parametric statistical technique, was used at a 5% level of significance ($\alpha = 0.05$). The test was considered appropriate because it compares the perceptions of more than two independent professional groups using ordinal data from the five-point Likert scale. The decision rule was to reject the null hypothesis when the p-value was less than 0.05 and to retain it when the p-value was equal to or greater than 0.05. Table 4 presents the distribution and retrieval of the questionnaires administered to the selected construction professionals and regulatory officials in Enugu State.

Table 4: Questionnaire Distribution Information

Target Population	No distributed	No. returned	Percentage returned %	No. not returned	Percentage not returned %
Builders	18	18	100.0	0	0
Architects	27	27	100.0	0	0
Quantity Surveyors	19	19	100.0	0	0
Engineers	51	50	98.0	1	2
Town Planners	56	54	96.4	2	3.6
Officials of ECTDA	76	76	100.0	0	0
Total	**247**	**244**	**98.8**	**3**	**1.2**

A total of 247 questionnaires were distributed, and 244 were completed and returned, representing an overall response rate of 98.8%. This exceptionally high retrieval rate indicates strong respondent commitment and the population were adequately represented.

A breakdown by professional bodies show that registered Builders, Architects, Quantity Surveyors, and Officials of the Enugu Capital Territory Development Authority (ECTDA) recorded a 100% response rate, while, Engineers (Mechanical, Structural, and Electrical) recorded a 98.0% response rate, with only one questionnaire not retrieved. Town Planners recorded a 96.4% response rate, with two questionnaires not returned. The consistently high response rates across all professional categories suggest that non-response bias is negligible and unlikely to affect the reliability of the findings. The remarkable retrieval rate can be attributed to the use of stratified random sampling, direct questionnaire administration, and consistent follow-up with respondents through their respective professional bodies and institutions. Consequently, the 244 valid responses provided a robust and representative dataset for the application of descriptive statistics and the Kruskal-Wallis H test, thereby enhancing the validity, reliability, and generalization of the study's conclusions. Table 5 presents the descriptive statistics on respondents' perceptions of policy gaps affecting sustainable construction practices in Enugu State.

Table 5: Identification of policy gaps in promoting sustainable construction practices

Variables	N	Mean	Std. Deviation	Ranks
Building regulations support sustainable construction.	244	2.91	1.25	1
Planning regulations promote green buildings.	244	2.67	1.03	3
The National Building Code is effectively enforced.	244	2.87	1.01	2
Government policies encourage climate-responsive design.	244	2.65	1.05	4
Building approvals support energy-efficient buildings.	244	2.64	1.09	5
Policies encourage green building materials.	244	2.61	1.13	6
The government provides incentives for green buildings.	244	2.48	1.08	8
Current policies encourage construction innovation.	244	2.57	1.05	7

Overall, the mean scores ranged from 2.48 to 2.91 on a five-point Likert scale, indicating that respondents generally perceived existing policy frameworks as inadequate for effectively promoting sustainable construction. Although, building regulations support sustainable construction recorded the highest mean

score (M = 2.91, SD = 1.25), the value remained below the benchmark for agreement, suggesting that respondents were unconvinced that the current regulatory framework sufficiently supports sustainability objectives. Similarly, the perceived enforcement of the National Building Code (M = 2.87, SD = 1.01) ranked second, implying that enforcement mechanisms remain weak despite the existence of national regulatory provisions. Planning regulations that promote green buildings (M = 2.67, SD = 1.03), government policies encouraging climate-responsive design (M = 2.65, SD = 1.05), and building approval processes supporting energy-efficient buildings (M = 2.64, SD = 1.09) also received relatively low ratings. These findings suggest that existing planning and approval systems have yet to adequately integrate sustainability principles into building development. This observation corroborates the argument that planning regulations in Enugu State continues to emphasise conventional development control while paying limited attention to energy efficiency, passive design strategies, and environmental sustainability (Okeke et al., 2020; Mba, 2025).

The lowest-rated variables were, policies encourage green building materials (M = 2.61, SD = 1.13), Current policies encourage construction innovation (M = 2.57, SD = 1.05), and the government provides incentives for green buildings (M = 2.48, SD = 1.08). The particularly low rating for government incentives demonstrates that respondents perceive inadequate financial and regulatory support for the adoption of sustainable technologies and environmentally friendly construction materials. The relatively higher standard deviations observed across most variables indicate some variation in respondents' perceptions; however, the overall pattern consistently reflects dissatisfaction with the existing policy environment. These findings are consistent with previous studies that identified outdated regulations, poor policy implementation, and weak institutional commitment as major impediments to sustainable construction in Nigeria. The regulatory framework is largely anchored on conventional construction approaches and lacks explicit provisions for climate-responsive design, low-carbon development, energy efficiency, and sustainable material utilisation. It further emphasises that the weak domestication and enforcement of the Nigerian National Building Code (2006) have limited the transition towards sustainable construction practices in Enugu State. Likewise, Chukwu *et al.* (2019) observed that inadequate policy support and limited institutional capacity continue to hinder the adoption of green building technologies in developing countries, while Mba *et al.* (2024) noted that the absence of sustainability-oriented regulations and incentives constrains innovation and investment in environmentally responsible construction practices.

The findings in Table 6 reveal that respondents generally agreed that institutional barriers constitute significant impediments to the adoption and implementation of sustainable construction practices in Enugu State, with all the identified barriers recording mean scores above the acceptance threshold of 3.50. This demonstrates a broad consensus among the different professional groups that institutional deficiencies continue to undermine the transition towards sustainable construction. Among the identified barriers, limited capacity of regulatory agencies emerged as the most critical institutional barrier (Mean = 4.32). This finding suggests that respondents perceive the existing regulatory institutions as lacking the technical expertise, human resources, and administrative capability required to effectively evaluate, monitor, and enforce sustainable construction requirements. The result corroborates the observations of Okereke *et al.* (2024), who reported that planning authorities in Enugu State suffer from inadequate multidisciplinary professional representation, thereby limiting effective development control. Similarly, the study supports the position of the Centre for Climate Change and Development (2021), which argued that weak institutional capacity remains one of the principal obstacles to the effective enforcement of sustainable building regulations in Nigeria.

Table 6: Identified Institutional Barriers in Promoting Sustainable Construction Practices

Institutional Barriers	Builders			Architects			Quantity Surveyors			Engineers			Town planners			ECTDA Officials			Combined		
	N	Mean	R	N	Mean	R	N	Mean	R	N	Mean	R	N	Mean	R	N	Mean	R	N	Mean	R
Regulatory agencies lack capacity.	18	4.06	7	27	4.28	3	19	4.53	2	50	4.28	1	54	4.37	7	76	4.35	1	244	4.32	1
Bureaucracy delays project approval.	18	4.50	1	27	4.36	1	19	4.65	1	50	4.17	4	54	4.24	2	76	4.21	2	244	4.28	2
Agencies collaborate poorly.	18	4.19	5	27	4.28	3	19	4.53	2	50	4.19	2	54	4.22	3	76	4.14	5	244	4.22	3
Political interference affects enforcement.	18	4.25	3	27	4.36	1	19	4.35	5	50	4.19	2	54	4.13	6	76	4.13	6	244	4.19	4
Planning agencies lack enough professionals.	18	4.25	2	27	4.16	6	19	4.35	5	50	3.91	8	54	4.22	3	76	4.19	3	244	4.15	5
Corruption weakens compliance.	18	4.25	4	27	4.24	5	19	4.47	4	50	4.00	7	54	4.02	8	76	4.18	4	244	4.14	6
Monitoring of projects is weak.	18	4.13	6	27	4.08	7	19	4.29	7	50	4.06	5	54	4.09	5	76	4.03	7	244	4.08	7
Building approvals take too long.	18	3.75	8	27	3.88	8	19	4.18	8	50	4.02	6	54	3.93	1	76	3.92	8	244	3.95	8

Legend: N = Population, R = Rank

The second-ranked barrier was bureaucratic delays in project approval (Mean = 4.28). The consistently high ratings across all professional groups indicate that lengthy approval procedures continue to discourage compliance with formal regulatory processes and delay sustainable project delivery. This finding aligns with the argument of Okereke *et al.* (2024), who noted that the prolonged integration of land titling and building approval procedures encourages developers to circumvent statutory approval systems. It also reinforces the assertion that cumbersome administrative procedures reduce the attractiveness of sustainable construction investments and weaken regulatory compliance.

Respondents also identified poor collaboration among regulatory agencies (Mean = 4.22) and political interference in enforcement activities (Mean = 4.19) as major institutional constraints. The findings imply that fragmented institutional responsibilities and external influence weakens coordinated implementation of sustainability policies. Effective sustainable construction governance requires integrated decision-making among planning authorities, professional regulatory bodies, and environmental agencies. This observation supports the findings of Okeke *et al.* (2020), who reported that fragmented physical planning administration significantly constrains development control in Enugu State, while Ejiofor (2023) emphasised that effective institutional leadership and collaboration are fundamental for achieving sustainable project outcomes. Furthermore, the shortage of qualified professionals within planning agencies (Mean = 4.15) and corruption that weakens regulatory compliance (Mean = 4.14) were perceived as substantial barriers. These findings indicate that institutional effectiveness depends not only on policy frameworks but also on the availability of competent professionals and transparent governance systems. The result agrees with Hilary *et al.* (2020), who observed that inadequate professional capacity among planning authorities contributes to poor supervision, ineffective enforcement, and increasing incidences of non-compliance with building regulations. Likewise, Okereke *et al.* (2024) reported that inadequate staffing and regulatory weaknesses create opportunities for illegal developments and poor-quality construction practices in Enugu State. Although weak monitoring of construction projects (Mean = 4.08) and lengthy building approval periods (Mean = 3.95) were ranked lower relative to the other variables, their mean scores still indicate strong agreement that they remain significant institutional obstacles. Weak monitoring limits continuous compliance assessment throughout the construction process, while prolonged approval timelines increase project uncertainty and encourage informal development practices. These findings are consistent with previous studies that identified inadequate monitoring, weak enforcement mechanisms, and ineffective development control as persistent challenges affecting sustainable urban development in Nigeria (Hilary et al., 2020; Okeke et al., 2020).

Table 7 shows the Kruskal-Wallis H test conducted to determine whether construction professionals differed significantly in their perceptions of the institutional barriers to sustainable construction practices in Enugu State, based on their profession.

Table 7: Kruskal-Walli's test on significant difference in the perceptions of institutional barriers to sustainable construction practices among construction professionals in Enugu State.

GROUP	N	Mean Rank	Kruskal-Wallis H	df	Asymp. Sig.
Builders	8	23.88			
Architects	8	26.81	14.720	5	0.01
Quantity Surveyors	8	40.06			
Engineers	8	16.00			
Town planners	8	21.00			
ECTDA Officials	8	19.25			
Total	48				

The results in Table 7 revealed a statistically significant difference among the professional bodies (H = 14.720, df = 5, p = 0.010), indicating that respondents' professional backgrounds significantly influenced their perceptions of institutional barriers. Consequently, the null hypothesis was rejected.

Quantity Surveyors recorded the highest mean rank (40.06), suggesting that they perceived institutional barriers to sustainable construction more strongly than the other professions. This was followed by Architects (26.81), Builders (23.88), Town Planners (21.00), ECTDA Officials (19.25), and Engineers (16.00), who recorded the lowest mean rank. These differences may be attributed to the distinct professional responsibilities and interactions of each group with planning regulations, project procurement processes, and institutional frameworks governing sustainable construction.

The significant variation in perceptions implies that institutional challenges are experienced differently across professional disciplines. Professionals who are more directly involved in project cost management, regulatory compliance, and approval processes are likely to encounter bureaucratic constraints, policy inconsistencies, and administrative bottlenecks more frequently than those whose responsibilities are primarily technical or design-oriented. The finding underscores the need for multidisciplinary policy reforms and greater collaboration among built environment professionals to address institutional barriers that impede the adoption and implementation of sustainable construction practices in Enugu State.

The findings presented in Table 8 shows that respondents generally agreed that Builders play significant professional roles in advancing sustainable construction practices in Enugu State, with all twelve variables recording mean scores above the acceptance threshold.

Table 8: Builders' Professional Roles (BPR) in promoting sustainable construction practices

	Builders			**Architects**			**Quantity Surveyors**			**Engineers**			**Town planners**			**ECTDA Officials**			**Combined**		
	N	Mean	R	N	Mean	R	N	Mean	R	N	Mean	R	N	Mean	R	N	Mean	R	N	Mean	R
Builders ensure quality control.	18	4.00	1	27	3.56	5	19	3.88	3	50	3.72	2	54	3.63	3	76	3.46	10	244	3.63	2
Builders reduce material waste.	18	3.75	2	27	3.96	1	19	4.00	1	19	3.68	4	54	3.70	1	76	3.64	4	244	3.73	1
Builders supervise site activities.	18	3.69	3	27	3.80	2	19	3.76	5	19	3.68	4	54	3.48	10	76	3.54	6	244	3.61	3
Builders enforce health and safety.	18	3.44	8	27	3.48	7	19	3.24	11	19	3.81	1	54	3.57	6	76	3.69	1	244	3.61	3
Builders inspect construction materials.	18	3.63	4	27	3.64	4	19	3.65	9	19	3.60	6	54	3.50	8	76	3.64	4	244	3.60	6
Builders ensure work follows approved drawings.	18	2.75	12	27	3.52	6	19	4.00	1	19	3.53	8	54	3.41	12	76	3.47	9	244	3.47	10
Builders assess buildability before construction.	18	3.38	9	27	3.76	3	19	3.29	10	19	3.38	10	54	3.61	5	76	3.49	8	244	3.50	9
Builders maintain structural quality.	18	3.56	6	27	3.48	7	19	3.82	4	19	3.49	9	54	3.50	8	76	3.51	7	244	3.53	8
Builders train site artisans.	18	3.63	4	27	3.48	7	19	3.76	5	19	3.28	12	54	3.54	7	76	3.38	12	244	3.45	11
Builders improve workers' skills.	18	3.38	9	27	3.36	11	19	3.71	7	19	3.38	10	54	3.46	11	76	3.43	11	244	3.44	12
Builders promote waste reduction.	18	3.50	7	27	3.32	12	19	3.18	12	19	3.72	2	54	3.63	3	76	3.69	1	244	3.59	7
Builders promote sustainable practices.	18	3.31	11	27	3.48	7	19	3.71	7	19	3.60	6	54	3.67	2	76	3.67	3	244	3.61	3

Legend: N = Population, R = Rank.

The results further indicate that builders' responsibilities extend beyond traditional site supervision to encompass sustainable site management, technical quality assurance, health and safety management, and capacity development, all of which are fundamental pillars of sustainable construction. Under Sustainable Site Management, respondents rated builders' ability to reduce material waste highest (Mean = 3.73), followed by supervision of site activities (Mean = 3.61) and promotion of waste reduction (Mean = 3.59). These findings suggest that construction professionals recognise Builders as the operational managers responsible for optimising resource utilisation and minimising construction waste. Effective site supervision enables builders to coordinate labour, monitor construction processes, and enforce efficient material usage, thereby reducing environmental impacts and improving project cost efficiency. This finding supports the position of Mba *et al.* (2024) that sustainable construction depends on effective resource management, waste minimisation, and environmentally responsible construction practices. Likewise, Ezeokoli *et al.* (2024) emphasises that Builders achieve sustainability through systematic material tracking, close supervision of artisans, and the implementation of practical waste reduction strategies that improve both environmental and economic performance. The Technical Quality dimension equally received favourable ratings, with Builders ensuring quality control ranking second overall (Mean = 3.63), followed by inspection of construction materials (Mean = 3.60), while ensuring compliance with approved drawings recorded a relatively lower mean (Mean = 3.47). The high ratings underscore Builders' statutory responsibility for translating design specifications into durable and sustainable physical structures through continuous inspection and quality assurance. However, the comparatively lower score for compliance with approved drawings suggests that deviations from approved designs remain a persistent challenge, largely due to weak regulatory enforcement and cost-driven project modifications. These findings corroborate Ezeokoli *et al.* (2024), who reported that systematic quality management significantly improves construction performance, while Hilary *et al.* (2020) observed that poor quality supervision contributes substantially to structural failures in Nigeria. Similarly, Ezeokoli *et al.* (2024) argues that Builders are responsible for implementing structured quality management systems, conducting material verification tests, and ensuring conformity with engineering specifications throughout project execution.

Regarding Health, Safety and Structural Integrity, respondents acknowledged Builders' important role in enforcing health and safety (Mean = 3.61), maintaining structural quality (Mean = 3.53), and assessing buildability before construction (Mean = 3.50). The findings indicate growing recognition that sustainable construction extends beyond environmental performance to include worker safety and long-term structural reliability. Builders are expected to enforce safety regulations, coordinate site operations, evaluate constructability, and ensure compliance with engineering standards. Nevertheless, the relatively moderate rating assigned to buildability assessment implies that multidisciplinary design reviews are not yet fully institutionalised within the project delivery process. This observation agrees with Ezeokoli *et al.* (2024), which identifies inadequate buildability and maintainability assessment within planning authorities as a major institutional barrier to sustainable construction in Enugu State. The findings further align with Mba *et al.* (2024) and Ezeokoli *et al.* (2024), who advocated integrated technical planning and continuous quality monitoring as prerequisites for resilient and sustainable infrastructure.

The Capacity Development dimension recorded comparatively lower, though acceptable mean scores, with Builders training site artisans (Mean = 3.45), improving workers' skills (Mean = 3.44), and promoting sustainable practices (Mean = 3.61). Although respondents acknowledged Builders' responsibility for workforce development, the lower ratings suggest that structured training and continuous professional development remain inadequate within the construction industry. This finding reflects the continued shortage of technically competent artisans capable of implementing modern sustainable construction techniques. Ezeokoli *et al.* (2024) similarly identifies workforce upskilling as one of the Builders' most strategic responsibilities, arguing that continuous training enhances workmanship, improves compliance with sustainable construction standards, and reduces defects associated with informal construction practices. This finding is also consistent with Chukwu *et al.* (2019), who concluded that capacity building remains indispensable for accelerating the adoption of green building practices in developing countries.

Table 9 shows the Kruskal-Wallis H test conducted to examine whether significant differences existed in the perceptions of Builders' roles in promoting sustainable construction practices among construction professionals in Enugu State, based on their profession.

Table 9: Kruskal-Walli's test on significant difference in the perceptions of Builders' roles in promoting sustainable construction practices among construction professionals in Enugu State.

GROUPS	N	Mean Rank	Kruskal-Wallis H	df	Asymp. Sig.
Builder	12	31.63	4.830	5	0.44
Architect	12	34.38			
Quantity Surveying	12	48.00			
Civil/Structural Engineer	12	37.38			
Town planner	12	34.21			
ECTDA Official	12	33.42			
Total	72				

As presented in Table 9, the test yielded a Kruskal-Wallis H statistic of 4.830 with 5 degrees of freedom and an asymptotic significance (p) value of 0.440. Since the p-value is greater than the 0.05 level of significance ($p = 0.440 > 0.05$), the null hypothesis was accepted. Although the mean ranks varied slightly across the professional groups, with Quantity Surveyors recording the highest mean rank (48.00), followed by Engineers (37.38), Architects (34.38), Town Planners (34.21), ECTDA Officials (33.42), and Builders (31.63), these differences were not statistically significant. This finding indicates that the observed variations in rankings were due to random sampling variation rather than genuine differences in professional opinion.

The result suggests a broad consensus among construction professionals regarding the roles of Builders in advancing sustainable construction practices in Enugu State. Irrespective of professional background, respondents generally shared similar views on the importance of Builders in coordinating construction activities, ensuring quality control, promoting sustainable construction methods, minimising material waste, and facilitating the implementation of environmentally responsible building practices. This convergence of opinion underscores the recognition of Builders as key stakeholders whose responsibilities extend beyond conventional site supervision to include the effective implementation of sustainability principles throughout the construction process.

5. Conclusion and Recommendations

The transition toward sustainable building construction practices in Enugu State is no longer an environmental ideal, but an urban imperative. This study examined the policy gaps, institutional barriers, and builders' professional roles in promoting sustainable construction practices in Enugu State, Nigeria. The findings reveal that existing policy and regulatory frameworks are inadequate to effectively support sustainable construction, particularly due to non-domestication of the Nigerian National Building Code (2006), weak enforcement of building regulations, limited incentives for green buildings, and insufficient policy provisions for sustainable innovations. Institutional barriers, including limited regulatory capacity, bureaucratic approval processes, poor inter-agency collaboration, and political interference, were identified as major constraints to the implementation of sustainable construction practices. Furthermore, while construction professionals differed significantly in their perceptions of institutional barriers, they demonstrated a common understanding of the critical roles of Builders in ensuring quality control, minimising material waste, enforcing health and safety, and promoting sustainable construction practices. In summary, achieving sustainable construction in Enugu State requires coordinated policy reforms, stronger institutions, and greater collaboration among built environment professionals. The study therefore recommends as follows;

1. Enugu State Government should collaborate with regulatory bodies in the built-environment (CORBON, ARCON, COREN, QSRBN, TOPREC) to review and strengthen existing building regulations and planning policies by domesticating the Nigerian National Building Code (2006). The code must incorporate mandatory sustainability requirements including requirements for rainwater retention systems in all new residential and commercial structures, effective enforcement mechanisms, and incentives for green building adoption.
2. Enugu Capital Territory Development Authority (ECTDA) and the Town Planning Authorities should be strengthened through recruitment of qualified professionals, continuous capacity building, and digitalisation of the building approval and monitoring processes to reduce bureaucratic delays. Vetting checklists should expand beyond the traditional boundary setbacks and basic structural stability to include buildability and maintainability analysis, evaluating energy efficiency, quality management plan, waste water management plan, health and safety management plan and permeable ground ratios.
3. Stronger collaboration should be established among regulatory agencies, professional bodies, and policymakers to ensure coordinated implementation and monitoring of sustainable construction policies.
4. Continuous professional development programmes should be promoted for the built environment professionals to enhance competencies in sustainable construction technologies, quality management, and resource-efficient construction practices.
5. Policymakers should develop financial and fiscal incentives, including tax reliefs, grants, and low-interest financing, to encourage investment in sustainable building materials, energy-efficient technologies, and innovative construction methods.
6. Create a database of registered construction professionals in the built-environment in Enugu State and make it accessible to the Enugu Capital Territory Development Authority (ECTDA) and the Town Planning Authorities field officers. Any project found operating under uncertified individuals ("quacks"), using forged stamps, or parading fake approval documents should face immediate site closure and severe legal prosecution.
7. Subsidize artisan upskilling and protect workers welfare. Partner with technical colleges and the Nigerian Institute of Building to fund state-subsidized green construction academies. Provide formal, continuous certifications for site artisans (masons, plumbers, electricians, carpenters, tilers and iron benders) on modern eco-friendly installation techniques.

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