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Evaluating Environmental Suitability And Regulatory Compliance Of Jendol Supermarket Facilities: Integrating Practical Mitigation And Enhancement Strategies For Sustainable Management

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Abstract: *Urban retail stores significantly impact environmental sustainability through high resource consumption, waste generation, and community engagement. In Nigeria, rapid urbanization and infrastructural limitations reveal regulatory gaps that exacerbate these impacts. To address this, NESREA has implemented frameworks covering waste control, effluent standards, ozone protection, and audits to promote compliance and sustainable development. This study evaluates Jendol Superstore's environmental operations and regulatory adherence against national and international standards. Using a structured site observation checklist and semi-structured interviews with the store manager, the research identified strong operational practices such as effective waste segmentation, cardboard recycling, regular refrigeration, grease trap maintenance, and compliant chemical storage. However, deficiencies were observed in energy and water monitoring, automation, environmental messaging visibility, regulatory documentation, and community engagement. Notably, energy and water efficiencies are underutilized, and no formal audits or Environmental Impact Assessments (EIA) are evident. While Jendol meets several compliance requirements, it remains vulnerable to inefficiencies and regulatory risks amid evolving enforcement standards. Recommendations include installing automated resource controls, formalizing extended producer responsibility programs, enhancing community outreach and signage, strengthening documentation procedures, and exploring renewable energy sources. Targeted modernization and institutionalized environmental management can position Jendol as a sustainability leader, serving as a replicable model for urban retail stores in similar contexts.*

Keywords: ***Environment; Sustainability; Retail Store; Environmental Impact; Urbanisation***

INTRODUCTION

Environmental sustainability has become a central pillar of contemporary business operations worldwide, driven by increasing societal expectations, corporate accountability, and evolving regulatory frameworks (Epstein & Buhovac, 2014). The retail industry's environmental footprint encompasses a range of location-specific impacts such as urban traffic congestion and wastewater runoff, as well as operational demands including waste management, energy consumption, and refrigeration systems (Beccarello et al., 2020). In today's complex retail landscape, compliance with sustainability standards is no longer a mere regulatory requirement but a critical component of responsible business practice and long-term viability (Lozano, 2015).

Retailers operate within a highly regulated environment that governs consumer protection, environmental standards, and resource management (Kumar & Saini, 2019). Developing countries like Nigeria face unique challenges in balancing rapid urbanization with sustainable facility management, often due to infrastructural limitations and weak enforcement of environmental policies (Ogunbode & Akinyemi, 2021). Consequently, assessing the environmental performance and regulatory adherence of chain supermarkets becomes vital for safeguarding ecological resilience and public health (Ogunbode & Akinyemi, 2021).

Regulatory compliance is a fundamental prerequisite for implementing effective environmental sustainability practices, especially among small and medium-sized enterprises (SMEs). Firms that adhere to environmental regulations are more likely to adopt practices that contribute positively to ecological conservation while ensuring economic viability (Dangelico & Pujari, 2010). Globally, environmental degradation poses significant concerns for stakeholders, prompting international efforts to address issues such as climate change and resource depletion (IPCC, 2021). For instance, the World Meteorological Organization (WMO) reported that atmospheric CO_2 levels reached 400 parts per million in 2015, marking a critical milestone in climate change history (WMO, 2015). In Africa, climate change threatens food security, with projections estimating that 20% of the continent's population could be at risk of hunger by 2050 due to environmental degradation (FAO, 2018).

While extensive research exists on regulatory compliance across various countries, there remains a notable gap in the literature concerning Nigerian enterprises, particularly locally owned organizations operating within the retail sector. A pertinent case study is Jendol Supermarket, a mid-sized retail chain operating in major Nigerian urban centers. Situated in densely populated areas, the supermarket's waste streams, logistical transportation networks, and energy-intensive refrigeration and lighting systems pose significant environmental challenges. However, these challenges also present opportunities for sustainable interventions, such as waste diversion initiatives, energy-efficient system upgrades, and sustainable procurement practices. This study aims to evaluate the environmental compliance and sustainability potential of Jendol Supermarket, addressing the core question: *How environmentally suitable and compliant are Jendol Supermarket facilities, and what practical measures can enhance their sustainability?*

The research is guided by the following objectives:

1. *To assess the environmental suitability of Jendol Supermarket's location, design, and operational practices.*
2. *To evaluate compliance with Nigerian environmental legislation and international standards.*
3. *To identify primary environmental challenges associated with waste, energy, water, and emissions.*
4. *To develop practical mitigation strategies aimed at reducing environmental impact.*
5. *To recommend resource efficiency measures, eco-friendly procurement options, and stakeholder engagement approaches.*
6. *To establish a monitoring and continuous improvement framework aligned with the Sustainable Development Goals (SDGs).*

The significance of this research is multifaceted. From a regulatory perspective, Nigeria's recent policy revisions including mandatory Environmental Impact Assessments (EIAs) and stricter audit protocols necessitate empirical assessments of compliance at commercial sites (Federal Ministry of Environment, 2018). Industry-wise, Nigeria's retail sector is undergoing rapid transformation, characterized by emerging food deserts and shifting consumer habits, underscoring the need for responsible operations that balance consumer access with environmental integrity (Adebayo & Oladipo, 2020). Supermarkets that integrate sustainability practices can contribute to urban resilience by reducing waste, conserving resources, and improving supply chain efficiency (Beccarello et al., 2020). According to (Amanawa & Ogechi, 2024), sustainable development demands a long-term structural plan for the world's economic and social systems that permanently reduces environmental and natural resource stress while maintaining economic growth and social harmony. Only progress that successfully balances these three factors can be sustained throughout time. In contrast, failing to address one of the three components may undermine the overall success of the development process. Because a synergy of these numerous outcomes is intended, it is usually assumed that sustainable development encompasses three dimensions:

- Social Solidarity.
- Environmental Responsibility.
- Economic Efficiency.

Furthermore, this case study offers insights applicable to similar contexts. Many Nigerian SMEs and mid-sized firms face barriers such as limited access to technology, funding constraints, and a lack of technical expertise, which hinder sustainability integration (Ogunbode & Akinyemi, 2021). By profiling a structured yet imperfect retail operation, this research highlights practical pathways such as cost-effective technological upgrades, enhanced stakeholder engagement, and improved documentation systems that can facilitate broader adoption of sustainable practices.

LITERATURE REVIEW

2.1. Sustainability and Circular Economy Frameworks: A Paradigm Shift towards Regenerative Development

The notion of sustainability has its roots in the profound realization that unbridled economic growth can have devastating consequences on human health, ecosystem function, and resource security (Elkington, 1994). As the world grappled with the unintended consequences of unchecked industrialization, John Elkington's seminal work, "Cannibals with Forks: The Triple Bottom Line of 21st Century Business" (1994), introduced a revolutionary framework that has since become a cornerstone of sustainable business strategy. The "triple bottom line" paradigm seamlessly integrates three interconnected dimensions of organizational success: financial viability, social equity, and environmental stewardship. This holistic approach advocates that businesses must prioritize not only profits but also the well-being of people and the planet to ensure long-term sustainability.

Nigerian policymakers have been at the forefront of embracing these principles, incorporating them into environmental legislation and policies aimed at promoting sustainable development (Federal Ministry of Environment, 2018). The country's commitment to

sustainable development is exemplified by its adherence to the United Nations' Sustainable Development Goals (SDGs), which provide a universal framework for achieving a more equitable and regenerative future (United Nations, 2015). The Nigerian government's efforts to develop a circular economy framework are particularly noteworthy, as this approach seeks to redefine the way businesses produce, consume, and waste resources, thereby minimizing environmental degradation and promoting a more regenerative future (World Economic Forum, 2019).

The circular economy framework has garnered significant attention in recent years, with scholars and policymakers recognizing its potential to drive sustainable growth and development (Geissdoerfer et al., 2017). This paradigm shift towards regenerative development emphasizes the need for businesses to adopt a more circular approach to production and consumption, one that prioritizes the reuse, recycling, and recovery of resources (European Commission, 2015). By doing so, businesses can reduce their environmental footprint, create new business opportunities, and contribute to the achievement of the SDGs.

Table 1. Nigeria's Environmental Performance Index

Areas	Rank: *N* = 180	Score
Environmental Performance Index	140	37.9
Ecosystem Vitality	131	44.1
Air Pollution	131	54.4
Agriculture	118	47.9
Water Resources	141	15
Environmental Health	164	20.3
Air Quality	159	17.9
Sanitation and Drinking Water	175	14.3
Waste Management	105	29.7
Climate Change	78	43.9
Projected emissions in 2050	160	6.3
CO2 exposure	170	20.4
Bioclimatic Ecosystem Resilience	171	0
Marine Habitat Protection	125	0.4

Source: Adesua-Lincoln, 2025

2.2. Environmental Suitability in Facility Planning

Assessing environmental suitability forms a critical foundation for sustainable facility planning, particularly in densely populated urban environments where the implications of siting decisions are profound and multifaceted. Location analysis must extend beyond mere logistical considerations to include an in-depth understanding of community dynamics, environmental sensitivities, and infrastructural capacities. Urban facility siting requires a proactive approach that anticipates potential community exposure to noise pollution, traffic congestion, runoff, and other environmental externalities that could compromise public health and quality of life (Environmental Review Report, 2024). Early-stage environmental impact assessments (EIAs) and audits are indispensable tools in this process, enabling planners to identify and mitigate adverse interactions between proposed facilities and surrounding ecosystems, especially in congested urban landscapes where interactions tend to be more complex and cumulative (OECD, 2019).

In the context of sustainable architecture, integrating environmental considerations into design processes significantly enhances the overall environmental performance of facilities. Passive design strategies, such as natural ventilation, daylight optimization, and the use of environmentally friendly, locally sourced building materials, serve to reduce operational energy demands and create healthier indoor environments. These approaches also contribute to climate resilience by decreasing reliance on mechanical systems, which are often energy-intensive and vulnerable to climate variability (ASHRAE, 2019). Despite the global prominence of green building

standards like LEED (Leadership in Energy and Environmental Design), there remains a notable gap in the application and customization of such standards within the Nigerian context, where local climatic conditions, resource availability, and infrastructural constraints demand tailored strategies that are yet to be fully explored or implemented (Adebayo & Oladipo, 2021).

Furthermore, designing for environmental suitability necessitates a comprehensive understanding of local ecological sensitivities, including biodiversity, water resources, and air quality. For example, siting supermarkets near water bodies or green spaces requires careful consideration of runoff management and pollution prevention measures to prevent habitat disruption and water contamination. Incorporating landscape ecology principles and green infrastructure solutions—such as permeable pavements, bioswales, and green roofs—can mitigate urban heat islands, enhance stormwater management, and improve overall urban resilience (Benedict & McMahon, 2006). These strategies, when embedded into facility planning, contribute to creating sustainable urban ecosystems that balance economic activity with ecological integrity.

In addition to physical siting and architectural design, community engagement plays a vital role in ensuring environmental suitability. Incorporating local stakeholder input helps identify contextual challenges and opportunities, ensuring that facilities do not inadvertently exacerbate existing environmental issues or create new ones. In Nigeria, where rapid urbanization often outpaces infrastructural development, participatory planning can foster shared ownership, reduce conflicts, and enhance compliance with environmental regulations (Ogunbode & Akinbode, 2020). The integration of geographic information systems (GIS) and spatial analysis tools further refines siting decisions by providing detailed insights into environmental constraints, demographic patterns, and infrastructural capacities.

Building on these considerations, the development of environmental suitability criteria must be an iterative process, incorporating ongoing monitoring and adaptive management strategies. Post-occupancy evaluations and environmental performance audits can identify unforeseen impacts, guiding continuous improvements in facility siting and design (Björk & Löfgren, 2018). Such adaptive approaches are particularly relevant in rapidly evolving urban contexts like Nigerian cities, where demographic shifts and climate change pose ongoing challenges to sustainable facility planning. These rules and regulations include several key provisions. They include limiting hazardous waste activities that do not require EPA permits, creating waste segregation and disposal criteria, and developing a national strategy to reduce and recycle waste. These guidelines establish a consistent approach to waste management in Nigeria, emphasizing the significance of environmental sustainability and legal compliance (Ololo & Amanawa, 2024).

2.3. Operational Sustainability: Waste, Energy, Water, Emissions

Operational sustainability within retail environments encompasses the management of complex resource flows; namely waste, energy, water, and emissions that directly impact environmental integrity and business viability. Retail outlets, particularly supermarkets, generate diverse waste streams, including solid waste, food waste, and packaging materials, often in large volumes that challenge waste management infrastructure (European Commission, 2018). The complexity of these waste streams necessitates a comprehensive, multi-tiered approach to waste minimization and resource recovery, emphasizing the importance of early interventions such as reducing unnecessary packaging, adopting refillable containers, and incentivizing customer participation in recycling programs.

Energy consumption, primarily driven by refrigeration, lighting, and heating, accounts for a significant portion of a supermarket's operational footprint. Refrigeration systems alone are among the most resource-intensive components, with energy audits revealing opportunities for optimization through advanced insulation, variable speed drives, and the transition to natural refrigerants with lower global warming potential (GWP) (IEA, 2020). Despite the recognized importance of energy efficiency, water use remains an often-overlooked aspect of operational sustainability. Activities such as cleaning, refrigeration, and catering contribute to high water demand, which can strain local water supplies, especially in water-scarce regions of Nigeria.

Water use efficiency strategies such as low-flow fixtures, rainwater harvesting, and greywater recycling are underutilized in many retail settings, yet they offer significant potential for reducing operational costs and environmental impacts (UNEP, 2019). Similarly, operational emissions, including greenhouse gases from energy use and transportation logistics, play a critical role in a supermarket's carbon footprint. Incorporating renewable energy sources, optimizing supply chain logistics, and adopting low-emission transportation modes can substantially reduce emissions, aligning retail operations with global climate commitments (IPCC, 2021).

Waste management strategies should prioritize the waste hierarchy prevent, reuse, recycle, recover, and dispose fostering a circular approach that minimizes landfill dependency. For instance, some supermarkets are exploring composting organic waste, converting food scraps into bioenergy or fertilizer, thus closing the loop on food waste (FAO, 2018). Similarly, the reuse of packaging materials, such as pallets and crates, reduces demand for virgin materials and minimizes waste generation (EMF, 2019). An integrated waste

and resource management plan should also consider the life cycle impacts of products and packaging, encouraging suppliers to adopt eco-design principles that facilitate reuse and recycling.

Operational efficiency measures are most effective when embedded in a broader sustainability management system that includes regular monitoring and reporting. Energy and water audits, coupled with real-time data collection, enable managers to identify inefficiencies and implement targeted interventions (ISO 50001, 2018). In Nigeria, capacity building and technical support are essential to enable retail managers to adopt these best practices, especially given varying levels of technical expertise and infrastructural constraints.

The adoption of innovative technologies such as smart meters, IoT-enabled refrigeration systems, and water-saving sensors can further enhance operational sustainability. These technologies provide granular data that support predictive maintenance, demand response, and resource optimization, thereby reducing operational costs and environmental impacts (McKinsey & Company, 2020). However, barriers such as high initial capital costs, lack of awareness, and limited access to financing impede widespread adoption within Nigerian retail settings.

2.4. Environmental Regulations and Standards in Nigeria

Nigeria's environmental regulatory landscape is characterized by a complex web of laws, agencies, and standards designed to safeguard ecological integrity while fostering sustainable economic growth. Central to this framework is the National Environmental Standards and Regulations Enforcement Agency (NESREA), established under the 2007 NESREA Act, which serves as the primary agency responsible for enforcing environmental laws across various sectors, including retail (NESREA, 2007). NESREA's mandate encompasses the regulation of waste management, emissions control, pollution prevention, and the enforcement of environmental standards, with a focus on ensuring compliance through audits, sanctions, and public awareness campaigns.

Nigeria's environmental regulations are comprehensive, covering 35 distinct regulations that address issues such as sanitation, waste management, ozone layer protection, emissions, effluent control, and hazardous substances. The recent strengthening of these regulations in 2023 reflects the government's increased commitment to environmental protection, aligning national standards with international best practices (Federal Ministry of Environment, 2023). For example, the Emission Standards Regulations prescribe limits for industrial emissions, while the Waste Control Regulations govern waste disposal practices, including regulations specific to the retail sector's packaging and food waste (NESREA, 2023).

Complementary legal instruments, such as the Environmental Impact Assessment (EIA) Act of 1992, establish procedures for evaluating the environmental consequences of development projects, ensuring that environmental considerations are integrated into planning processes from the outset (FME, 1992). The Sanitation and Waste Control Regulations of 2009 further specify standards for waste collection, transportation, and disposal, emphasizing the importance of environmentally sound waste management systems (FME, 2009). These legal frameworks collectively create a procedural and substantive basis for environmental oversight and compliance.

Enforcement mechanisms are a critical aspect of Nigeria's regulatory regime. NESREA conducts routine audits, inspections, and facility closures to enforce compliance, with recent reports indicating that between 46 and 160 facilities have been shut down from 2022 to 2024 due to non-compliance (NESREA, 2024). These enforcement activities are complemented by penalties, sanctions, and public notices aimed at deterring violations. However, enforcement effectiveness often faces challenges stemming from limited resources, inadequate technical capacity, and enforcement gaps, particularly in informal sectors and small-scale retail outlets.

Despite the existence of a robust legal framework, compliance remains uneven across Nigeria's retail sector. Many small and medium-sized enterprises, including supermarkets, lack awareness of regulatory requirements, and face difficulties in meeting compliance standards due to financial constraints, inadequate technical capacity, or weak institutional oversight. This underscores the need for targeted capacity building, stakeholder engagement, and incentives that encourage voluntary compliance and promote a culture of environmental responsibility among retail businesses. Regulatory frameworks must also evolve to address emerging environmental challenges such as plastic pollution, climate change, and waste management innovations. The recent introduction of sector-specific regulations on plastic waste management, coupled with initiatives like the Extended Producer Responsibility (EPR) programs led by industry associations such as the Food and Beverage Recycling Alliance (FBRA), exemplify efforts to align regulatory policies with sustainable waste management practices (FBRA, 2023). These initiatives demonstrate how regulation can catalyze industry-led innovations and foster collaborative approaches to environmental stewardship.

International cooperation and adherence to global environmental agreements also influence Nigeria's regulatory landscape. Nigeria is a signatory to conventions such as the Basel Convention on hazardous waste and the Paris Agreement on climate change, which impose obligations to reduce environmental harm and transition to low-carbon development pathways (UNEP, 2019). Integrating these commitments into national policies enhances Nigeria's capacity to meet international standards and mobilize resources for environmental management.

2.5. Environmental Audit and Management Systems

Environmental audits are a vital component of an organization's commitment to sustainability and regulatory compliance, serving as systematic tools to evaluate environmental performance, identify risks, and foster continuous improvement. In Nigeria, environmental audits encompass a broad spectrum of assessments, including compliance audits, energy audits, waste audits, and the implementation of Environmental Management Systems (EMS), 0and are mandated periodically by regulatory authorities such as NESREA (NESREA, 2011). These audits are integral to Nigeria's broader environmental governance framework, facilitating transparency and accountability in industrial and commercial operations.

The concept of environmental auditing in Nigeria was formalized through the development of guidelines by the Federal Environmental Protection Agency (FEPA) and later refined in 2011 to align with international standards like ISO 14001. The guidelines emphasize that audits should not be a one-time compliance exercise but an ongoing process embedded within an organization's operational culture. This approach encourages organizations to adopt a proactive stance on environmental issues, fostering a culture of continual improvement rather than reactive compliance (FEPA, 2011).

Internationally, standards such as ISO 14001 have become benchmarks for effective environmental management. ISO 14001 provides a systematic framework for organizations to identify environmental impacts, set targets, implement control measures, and monitor progress (ISO, 2015). Its adoption facilitates integration with other management systems like quality and occupational health and safety, offering a comprehensive approach to sustainability management.

One of the challenges faced by Nigerian organizations, including supermarkets, is the limited capacity for comprehensive audits due to resource constraints, lack of technical expertise, and inadequate infrastructure. To address this, capacity-building initiatives, partnerships with international agencies, and industry-specific training programs are essential to enhance audit quality and effectiveness (Ojo & Akinbami, 2018).

Periodic environmental reporting, aligned with audit findings, enhances transparency and accountability to stakeholders, including regulators, customers, and the local community. Public disclosure of environmental performance fosters trusts and can serve as a competitive advantage in markets increasingly driven by sustainability credentials (Kassinis & Soteriou, 2003). For supermarkets, transparent reporting on waste reduction, energy efficiency, and emissions can bolster brand reputation and customer loyalty.

2.6. Sustainable Procurement and Green Supply Chains

Sustainable procurement and the development of green supply chains are pivotal strategies for embedding environmental responsibility into core business operations within the retail sector. These approaches emphasize the importance of integrating environmental criteria into procurement decisions, promoting eco-friendly sourcing, and fostering collaboration with suppliers committed to sustainability (Srivastava, 2007).

In Nigeria, the adoption of sustainable procurement practices remains nascent but is gaining momentum through sector-specific initiatives like the Food and Beverage Recycling Alliance (FBRA). The FBRA exemplifies how sectoral collaboration can drive waste recovery efforts, particularly in managing plastic packaging waste, which constitutes a significant environmental challenge (FBRA, 2023). By engaging manufacturers, retailers, and consumers in shared responsibility, these initiatives foster a circular approach to packaging that reduces reliance on virgin materials and promotes recycling and reuse. Implementing green supply chains requires a comprehensive understanding of lifecycle impacts, from raw material extraction to end-of-life disposal. Retailers can influence this process by specifying sustainability criteria in supplier contracts, such as the use of environmentally friendly packaging, ethically sourced raw materials, and low-impact transportation modes (Seuring & Gold, 2013). Developing supplier sustainability standards encourages upstream innovation and aligns supply chain practices with broader environmental goals. Leveraging local resources and fostering domestic eco-innovation are vital for the success of green supply chains. For example, promoting the use of biodegradable packaging derived from indigenous materials can reduce plastic waste and support local industries. Capacity-building programs targeting suppliers and vendors are essential to facilitate compliance with sustainability standards, especially for small and medium enterprises that may lack technical expertise.

Technology plays a crucial role in enabling green supply chain management. Digital platforms for real-time tracking of shipments, inventory, and waste flows enhance transparency, facilitate data-driven decision-making, and improve responsiveness to environmental issues (Carter & Rogers, 2008). For example, block chain technology can be employed to verify supply chain sustainability claims, building consumer trust and meeting regulatory requirements.

In addition to environmental benefits, sustainable procurement can yield economic advantages. Cost savings arise from reduced material usage, minimized waste disposal fees, and improved operational efficiencies. Market differentiation is another critical benefit, as environmentally conscious consumers increasingly favor brands with transparent sustainability credentials. These advantages incentivize retailers to embed sustainability into procurement and supply chain management strategies (Lacy et al., 2020).

The role of policy and regulations in promoting green supply chains cannot be overstated. Governments can stimulate sustainable procurement through incentives, standards, and procurement policies that prioritize eco-friendly products and services. For instance, Nigeria's recent circular economy roadmap underscores the importance of sustainable supply chain practices and encourages industry-led initiatives to transform waste management and resource use (Federal Ministry of Environment, 2024).

2.7. Effective Stakeholder Engagement and Community Integration

Effective stakeholder engagement and community integration are fundamental components of environmental and social sustainability in retail operations. Stakeholder engagement refers to the process of working collaboratively with diverse groups such as customers, employees, suppliers, regulators, local communities, and civil society to address shared environmental and social concerns (Freeman, 1984). Within the supermarket and retail context, this multidimensional engagement fosters trust, enhances legitimacy, and ensures that sustainability initiatives are responsive to local needs and expectations.

Public consultation and participatory governance frameworks such as those emphasized by NESREA are critical for embedding environmental concerns into operational decision-making. These frameworks advocate for transparent communication channels, active solicitation of community input, and mechanisms for grievance resolution (OECD, 2011). For example, community forums and social audits enable retailers to understand local environmental priorities, address concerns about noise, waste, or traffic, and co-develop solutions that benefit both business and community welfare.

Empirical studies from developed nations illustrate diverse approaches to stakeholder collaboration in retail settings. U.S.-based neighborhood grocery stores serving lower-income communities often employ informal outreach strategies such as community meetings, flyers, and local partnerships to foster social cohesion and environmental responsibility (Kollmuss & Agyeman, 2002). Some stores go further by establishing coalitions with local organizations, enabling residents to influence store policies on waste management, employment, and community development.

In the UK, retailers like Aldi, Lidl, and Sainsbury's actively engage communities through surplus food donation programs, volunteering initiatives, and grants provided via platforms like Neighbourly (Sustainable Food Trust, 2020). These initiatives serve dual purposes: reducing waste and building social capital, which ultimately supports long-term sustainability goals. Such practices exemplify how retail establishments can position themselves as civic anchors capable of fostering social inclusion and environmental stewardship.

In Nigeria, stakeholder engagement within the retail sector is emerging as a strategic priority, especially within the framework of the national Circular Economy Roadmap launched in 2024 (Federal Ministry of Environment, 2024). The development of this roadmap involved multi-stakeholder consultations, including government agencies, industry associations, NGOs, and community representatives, reflecting a collective commitment to sustainable transformation. Industry-led initiatives like the Food and Beverage Recycling Alliance (FBRA) exemplify how private-sector actors can mobilize community participation through public awareness campaigns, community mobilization, and advocacy efforts that promote waste recovery and responsible consumption (FBRA, 2023).

However, smaller retail outlets, such as local supermarkets and informal food vendors, often face significant challenges in stakeholder engagement. These include limited capacity to convene stakeholders, low awareness of best practices, and resource constraints. Despite these barriers, grassroots initiatives and informal community networks can serve as effective platforms for fostering local stewardship, social cohesion, and shared environmental responsibility. For instance, community-led food retailers actively promote localized food distribution, identity-building, and social capital, which contribute to resilience and sustainable neighborhood development.

The continuum of stakeholder engagement ranges from basic informational outreach such as signage, flyers, and social media to active participation, shared governance, and co-creation of sustainability initiatives. Research indicates that meaningful engagement hinges on transparent communication, inclusivity, and establishing platforms for ongoing dialogue (Arnstein, 1969). Building mutual trust and providing stakeholders with tangible influence over decision-making processes enhance operational legitimacy and facilitate the successful implementation of circular and sustainability initiatives.

For retail organizations, creating inclusive engagement strategies involves developing participatory mechanisms that respect local cultural contexts, address power imbalances, and foster long-term relationships. These may include stakeholder advisory panels, community liaison officers, or collaborative planning forums. Such strategies enable retail firms to better understand local environmental challenges, co-develop context-specific solutions, and cultivate community ownership of sustainability goals.

Ultimately, stakeholder engagement and community integration are not merely compliance or public relations exercises but strategic imperatives for embedding sustainability into the core business model. They serve to align business practices with societal values, enhance social license to operate, and foster resilient, adaptive communities capable of supporting long-term environmental and social well-being. As Nigeria advances its sustainability agenda, fostering inclusive, participatory approaches will be crucial in translating policy commitments into tangible, community-supported outcomes that benefit both businesses and society at large.

METHODOLOGY

3.1. Research Approach

This study adopts a mixed-method research design, integrating both qualitative and quantitative methodologies to comprehensively address the research objectives (Creswell & Plano Clark, 2017). Such an approach enables triangulation of data sources, enhancing the validity and reliability of findings (Denzin, 1978). Quantitative data provides measurable insights into environmental performance and regulatory compliance, while qualitative data offers contextual understanding of stakeholder perceptions, operational practices, and institutional challenges. This combination aligns with best practices in sustainability research, which emphasize the importance of capturing both empirical metrics and experiential narratives (Bryman, 2016).

3.2. Case Study and Site Selection

The case study focuses on Jendol Superstore and Eatery, situated along Idiroko Road in Ota, Ogun State, Nigeria. This site was selected based on purposive sampling criteria to ensure representativeness of urban retail environments within Nigerian contexts (Yin, 2014). The criteria included accessibility, operational scale, and relevance to urban environmental challenges highlighted in prior studies (Kohli & Jaworski, 1990). The site's strategic location and operational profile make it an appropriate case for examining environmental sustainability and regulatory adherence in Nigerian urban retail settings.

3.3. Data Collection

Data collection employed a combination of structured site observations, document reviews, and stakeholder interviews, consistent with qualitative case study protocols (Stake, 1998). Site visits involved systematic environmental audits using standardized checklists aligned with national regulations and international standards (NESREA, 2009; ISO, 2015). Key domains assessed included location attributes, architectural features, facility equipment, waste management, and operational practices.

Environmental data was gathered through direct field measurements, such as noise levels (using decibel meters), stream discharge rates, and visual documentation of runoff and waste infrastructure. Facility records supplied quantitative data on energy, water consumption, waste volumes, and procurement patterns, facilitating a detailed operational profile.

Qualitative insights were obtained via semi-structured interviews with the facility manager, following ethical protocols (Bryman, 2016). Interviews explored perceptions of sustainability practices, regulatory awareness, operational challenges, and future improvement opportunities. All interviews were conducted with informed consent, recorded, transcribed verbatim, and anonymized to ensure confidentiality.

3.4. Data Analysis

Quantitative data from audits and measurements were analyzed descriptively, employing frequency counts and rating scales (1-5) to evaluate compliance levels against established regulatory benchmarks (e.g., NESREA, 2009; EIA Act, 1992). A scoring matrix categorized responses as "Yes," "No," or "Not applicable," providing a structured assessment of regulatory adherence.

Qualitative data from interview transcripts underwent thematic content analysis, following Braun and Clarke's (2006) methodology. Coding focused on recurring patterns related to sustainability awareness, regulatory challenges, and operational bottlenecks. Thematic categories were cross-referenced with observational data to identify convergences or discrepancies, strengthening interpretive validity.

3.5. Ethical Considerations

The study adhered to ethical standards outlined by institutional review boards (Creswell & Plano Clark, 2017). Participants were briefed on their rights, including the right to withdraw at any time. Data confidentiality was maintained through anonymization, and no personal identifiers were published. Observations were conducted unobtrusively, minimizing interference with store operations. All data handling complied with relevant ethical guidelines to ensure research integrity.

This methodological framework ensures robust data triangulation, integrating statistical evaluation with contextual insights. The combined qualitative-quantitative approach facilitates comprehensive understanding of environmental sustainability practices, regulatory compliance, and operational realities within the Nigerian retail sector. Findings derived from this methodology inform targeted mitigation strategies, policy recommendations, and the development of a sustainable monitoring framework aligned with Nigeria's regulatory landscape and global sustainability standards (Creswell & Plano Clark, 2017; Yin, 2014).

RESULTS AND DISCUSSION

This section synthesizes the findings from structured observations and stakeholder interviews, evaluating Jendol Superstore and Eatery's environmental performance against regulatory standards and international sustainability best practices. The analysis is organized into core environmental areas, encompassing waste management, energy efficiency, water management, refrigeration practices, hazardous materials handling, drainage and noise control, staff training, signage, community engagement, and regulatory documentation.

4.1. Waste Management, Recycling, and Packaging

Observations confirmed that Jendol effectively segregates waste at the departmental level, categorizing organic, recyclable, and general waste streams consistently across the supermarket, bakery, and eatery sections. This aligns with established waste segregation principles emphasizing source separation to facilitate recycling and resource recovery (Karak et al., 2012). The presence of departmental bins and a central waste collection point suggests adherence to good waste management practices. Staff training incorporating waste sorting shadowing and daily briefings further supports proper segregation (Abila & Aghav, 2010). However, recycling activities appear passive, with the supermarket awaiting external collection without active engagement or formal Extended Producer Responsibility (EPR) mechanisms. Globally, integrating EPR schemes has been shown to enhance resource recovery, promote circular economy principles, and reduce environmental impacts (OECD, 2016). The use of reusable foil plates and accessible reusable bags demonstrates positive packaging reduction initiatives, although limited deployment across all departments constrains their effectiveness. Best practices recommend expanding such initiatives and establishing formal partnerships with recycling entities to maximize resource recapture (Zhu et al., 2018). Overall, Jendol's waste segregation aligns with sustainable waste management frameworks but could benefit from strengthened recycling partnerships and expanded reuse initiatives.

4.2. Energy Use and Efficiency

Current energy management at Jendol relies on manual controls, with lighting and HVAC systems operated by staff without automation or real-time monitoring (Khan et al., 2019). This approach limits operational efficiency and energy savings potential. The absence of consumption tracking and formal targets reflects a reactive rather than proactive energy management strategy, which is inconsistent with recognized best practices in energy efficiency (Liu et al., 2023). Studies indicate that implementing energy benchmarking and monitoring systems can lead to significant efficiency gains in some cases up to 30%, by identifying high-energy-consuming areas and optimizing operational practices (United Nations Environment Programme, 2019; Rios-Fernandez et al., 2024). Introduction of passive controls such as LED lighting, occupancy sensors, and smart thermostats can substantially reduce energy consumption (Mehmeti et al., 2020). Formal adoption of energy management systems aligned with ISO 50001 standards can institutionalize continuous improvement processes, fostering sustainable energy practices within retail establishments (ISO, 2018).

4.3. Water Management and Effluent Control

Water conservation measures, such as timed taps and grease traps, are operationally effective at Jendol, aligning with best practices for water efficiency and effluent compliance (Eneyo, 2022; Samarasiri et al., 2022). Timed fixtures reduce wastage, while fat traps prevent grease ingress, mitigating environmental pollution and regulatory violations (S.I. 22/2011). However, the lack of flow restrictors in the bakery and absence of water usage monitoring hinder performance tracking and optimization. Studies emphasize that metering water consumption across operational units enhances accountability and informs targeted conservation strategies (Omoregbe & Obasogie, 2018). Incorporating simple water metering and logging can help identify wastage hotspots and ensure compliance with NESREA regulations, which mandate efficient water management (NESREA, 2009). Such measures could improve operational efficiency and environmental compliance simultaneously.

4.4. Refrigeration Management and Ozone Protection

Refrigeration units at Jendol are maintained systematically, with daily defrosting, temperature logging, and leak prevention, consistent with operational best practices (Ravi & Murali, 2020). Maintaining proper refrigeration reduces energy use and minimizes refrigerant leaks, which are critical for ozone layer protection (S.I. 65/2022). The adherence to routine maintenance and temperature control aligns with regulatory requirements for ozone-depleting substances (ODS) management (UNEP, 2018). Further improvements include documenting leak detection procedures and transitioning to low-GWP refrigerants, which are globally recognized strategies for reducing environmental impact (IPCC, 2017; S.I. 65/2022). Such measures would reinforce compliance and sustainability in refrigeration operations.

4.5. Hazardous Materials Management

Chemical and refrigerant storage at Jendol is compliant with regulatory standards, with appropriate labeling, secondary containment, and availability of Material Safety Data Sheets (MSDS). Proper storage reduces risks of spills, accidents, and environmental contamination, as advocated in hazardous materials management literature (OSHA, 2020). Regular staff training further supports safe handling practices, aligning with occupational health and safety guidelines (ILO, 2019). To strengthen compliance, implementing periodic chemical audits and inventory management systems would ensure ongoing adherence and risk mitigation.

4.6. Drainage and Nuisance Management

Drainage infrastructure was observed to be functional, with clear and unobstructed drains effectively managing runoff during site visits. The absence of pooling or sediment buildup indicates proper maintenance and operational effectiveness. Such infrastructure is vital for flood mitigation and environmental protection, especially in urban settings (Adeboye et al., 2017). Noise assessments revealed that operational noise levels, including refrigeration and generator use, were within acceptable limits, with no significant disturbance observed. However, the lack of documented noise mitigation strategies, such as scheduled deliveries or acoustic barriers, poses potential risks as operational intensities increase (WHO, 2010). Implementing scheduled delivery times and noise dampening measures would proactively manage ambient noise and prevent future violations.

4.7. Staff Training, Signage, and Community Engagement

Staff training programs in sanitation and customer service are well-established, fostering internal environmental awareness (Adewuyi & Adeyemo, 2019). Nonetheless, the scarcity of environmental signage and absence of community engagement initiatives limit external reinforcement of sustainability practices and stakeholder participation. Literature emphasizes that visible signage enhances compliance and awareness among staff and customers, while community engagement fosters social license and local stewardship (OECD, 2011; UNEP, 2019). Jendol could enhance its environmental communication by installing signage and establishing dialogue channels with local communities, aligning with participatory sustainability frameworks (Brundtland Commission, 1987).

4.8. Regulatory Documentation and Internal Audits

Jendol maintains registration with key regulatory bodies but lacks visible Environmental Impact Assessment (EIA) certification, which is critical for demonstrating compliance and environmental due diligence (NESREA, 2009). Internal audits exist but lack systematic documentation of corrective actions, reducing their strategic value. Integrating these processes into an Environmental Management System (EMS) aligned with ISO 14001 could institutionalize continuous improvement and regulatory compliance (ISO, 2015). Such systems facilitate audit tracking, corrective action management, and stakeholder confidence, ultimately supporting sustainable operational practices.

Table 2. Summary of Observations

Observation Area	Compliance	Rating
Waste Management	Yes	4
Recycling practices	Yes	3
Packaging reduction	Yes	3
Effluent control	Yes	5
Energy use	No	2
Water Efficiency	Yes	4
Refrigeration Management	Yes	5
Hazardous Materials	Yes	4
Drainage and Noise control	Yes	4
Training and Awareness	Yes	4
Signage	No	2
Community Engagement	No	1
Regulatory Documentation	Yes	3

DISCUSSION

The insights from this study echo broader trends observed across Nigerian SMEs and retail businesses, where awareness of sustainability practices is growing, yet the full adoption of circular economy principles remains elusive. While many firms engage in basic recycling, reuse, and resource-efficient practices, Jendol included, there is often a disconnect from comprehensive circular models such as those championed by the Ellen MacArthur Foundation or Elkington's 3Ps framework. Specifically, Jendol demonstrates commendable waste segregation and recycling efforts; however, it falls short of establishing formal partnerships like Extended Producer Responsibility (EPR) schemes or developing scalable reuse initiatives that could elevate its sustainability maturity (Adesua-Lincoln, 2025).

Research underscores that integrating green logistics and holistic waste management systems supported by active stakeholder networks can significantly bolster social sustainability outcomes. Unfortunately, Jendol's lack of structured community engagement or feedback channels hampers its ability to galvanize local support, enhance compliance awareness, or build social credibility. In contrast, industry leaders like Nestlé Nigeria have made tangible progress through community clean-ups and awareness campaigns, demonstrating how stakeholder involvement can drive social and environmental impact.

On the organizational front, a culture rooted in environmental responsibility is known to enhance resource efficiency and overall sustainability performance, especially when reinforced through training, transparent reporting, and shared values. At Jendol, daily

staff briefings and chemical handling training indicate an emerging sustainability mindset. However, the absence of visible signage and limited audit transparency suggest that this culture needs further reinforcement through formalized mechanisms such as signage, routine audits, or recognition programs to embed environmental responsibility more deeply.

While Jendol's operational practices align with initial steps toward sustainability and reflect some globally recognized principles, it has yet to fully embrace systems-based, circular approaches. Its gaps, particularly in establishing supply chain partnerships, formal EPR frameworks, automated monitoring, and stakeholder engagement highlight key areas for strategic growth. Moving beyond mere compliance, adopting structured environmental management systems and fostering active stakeholder collaboration will be essential for Jendol and similar Nigerian SMEs to transition from operational compliance to industry leadership in sustainable retail.

CONCLUSION

This study examined Jendol Ota Retail Store's environmental performance through structured observation, interviews, and compliance benchmarking. The store demonstrates commendable operational strengths, including systematic waste segregation, efficient cardboard packaging recycling, daily grease-trap and refrigeration system maintenance, and careful chemical management. These practices reflect the organization's commitment to environmental governance and operational diligence, as evidenced by compliance with NESREA's waste and hazardous material regulations.

However, significant sustainability gaps remain. Energy management largely depends on manual, informal processes without automation or performance monitoring. While some water-saving measures are in place, there is no systematic monitoring or efficiency tools beyond the restaurant. Although departmental training, corporate messaging, and customer engagement are present, they do not physically reinforce environmental awareness. Additionally, inconsistencies exist in regulatory documentation, such as EIA certificates and corrective-action audit logs. Importantly, the store lacks social license to operate and stakeholder insights, primarily due to the absence of community engagement initiatives.

To address these gaps and enhance the store's environmental sustainability practices, several strategic actions are recommended: integrating automated energy and water management systems, improving waste and packaging stewardship, strengthening documentation and audit transparency, initiating proactive community engagement, increasing staff involvement, and adopting renewable energy solutions. Implementing these measures will enable Jendol to transition from operational compliance to sustainability excellence meeting regulatory requirements while fostering a resilient, socially responsible, and environmentally progressive brand.

These recommendations align with NESREA's sustainable development agenda and resonate with growing global consumer expectations for environmental stewardship and transparency. The holistic approach outlined here offers Jendol the opportunity to evolve from a functional urban retailer into a model of sustainable commercial practice, setting new standards for responsible retailing in Nigeria.

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