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Energy Transition Pressures and Supply Chain Sustainability: Evidence from Corporate Reports in the Nigerian Oil and Gas Sector

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Abstract

Introduction: The global energy sector is undergoing a social and technical transformation which forces oil and gas companies to change their methods for Sustainable Supply Chain Management. The research investigates how international and Nigerian oil and gas companies handle energy transition challenges while maintaining their sustainability reporting requirements. The research study demonstrates how people talk about transitions but their real-world applications of sustainable supply chain management show different results. The research demonstrates how supply chain operations respond to unconventional energy sources together with renewable energy sources during periods of low-carbon transition.

Methods: The research analyzes corporate disclosures from sixteen selected companies through a comparative content analysis method. The researchers created four company groups which included Global Majors, Indigenous Nigerian Majors, National Champions and Downstream Leaders. The research investigates energy transition discourse through Legitimacy Theory and the Sociotechnical Transition Framework by assessing its extent and nature and the energy types that receive long-term resilience priorities and the resulting effects on supply and production and logistics management.

Findings: The research reveals that organizations face two primary challenges which include their operational performance problems and their implementation of multiple decarbonization strategies. Global Majors (e.g., Shell, Eni, TotalEnergies) are pursuing a radical "regime shift" toward carbon-neutral niches such as hydrogen and offshore wind, supported by sophisticated digital ESG auditing of "Scope 3" emissions. The Indigenous Nigerian companies (e.g., Seplat, Aradel, NNPC Ltd) which follow a "regime optimization" strategy use the "Gas-to-Power" system to meet international environmental standards while ensuring their domestic energy supply and "Africapitalism" goals. The industry considers Production Management activities which include ending routine flaring and fluid recycling to be essential for all operations while Logistics Management remains the most under-reported domain across the industry.

Originality: The study establishes that Nigerian emerging economies achieve resilience through their existing fossil fuel infrastructure "greening" process instead of implementing immediate renewable resource diversification. The research findings about policy development help establish regional ESG standards which create better supply chain circularity between the Global South countries.

Keywords: Content Analysis, Sustainable Supply Chain Management (SSCM), Oil and Gas,

Decarbonization Pathways, Legitimacy Theory.

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Introduction

The global oil and gas (O&G) industry is currently undergoing two major changes because it is moving from traditional resources to new resources and it is starting to implement renewable energy solutions (Dongo & Relvas, 2025; Otsubo, 2026). While addressing growing environmental issues brought on by public, governmental, and regulatory expectations for sustainable operational methods, the industrial sector retains its ability to propel socioeconomic advancement. Sustainable Supply Chain Management (SSCM) operates as the primary force which enables organizations to accomplish their business sustainability goals through socially responsible and environmentally friendly and economically viable practices (Ajayi et al., 2025; Waqar et al., 2025; Xiaoying et al., 2026). The research shows a major understanding gap between how organizations experience transition pressures and their actual supply chain disclosure practices, which researchers found when they analyzed international corporations versus local Nigerian businesses. This study is motivated by the urgent need for oil and gas companies to remain compatible with a low-carbon future while navigating the high prices and technical challenges of unconventional and renewable energy. The research problem exists because energy transition discussions at the highest level do not match the actual implementation of SSCM practices. Global leaders know how to use green technologies but Nigerian companies which now operate extensive onshore assets face financial and regulatory challenges that restrict their supply chain visibility and progress toward sustainability (Asu, 2024; Bello, 2024; Fair Finance Nigeria, 2025; Futican, 2025; Ojo et al., 2022; Shao et al., 2025). The research examines how global and Nigerian oil and gas companies face energy transition challenges and how they disclose these challenges in their sustainability reports. The specific objectives are:

1. To determine the extent and nature of energy transition discussions within the corporate reports of the selected companies.
2. To identify the specific types of energy (unconventional vs. renewable) being prioritized by global majors operating in Nigeria compared to indigenous Nigerian firms.
3. To analyze the implications of these transitions on supply, production, and logistics management practices.

The remainder of this paper is organized as follows: Section 2 reviews the literature on energy transition and SSCM theory. Section 3 details the content analysis methodology and the criteria used for sample selection. Section 4 presents the comparative results and discussion. Section 5 concludes with recommendations for more research, policy implications for Nigeria's energy industry, and conclusions.

Literature review

The literature describes SSCM as an organizational framework which enables organizations to achieve their social and environmental and economic objectives through coordinated management of their essential business operations (Abdo Hamza & Rego, 2025; Ndinojuo & Ikems, 2023; Primadasa et al., 2025). The oil and gas (O&G) sector needs this integration to protect its assets against environmental changes while maintaining its long-term operational capacity. The sector currently operates under a sociotechnical landscape which forces fossil fuel systems to implement sustainable practices because of governmental and regulatory pressures (Boulton & Krumdieck, 2025; Llavero-Pasquina et al., 2025; Ndinojuo & Samuel, 2026). Two transition categories, which demonstrate how businesses are shifting away from conventional resources and creating new energy solutions using alternative sources like biofuels and solar and wind energy, are part of the current industry reaction. While global majors often possess the technical know-how to pursue renewable niches, they primarily focus on unconventional O&G to maintain reserves (Afewerki et al., 2026; Kapacinskaite, 2026; Phirouzabadi & Thune, 2025). Transitioning creates significant implications for supply chains, requiring new strategies for sustainable

sourcing, process efficiency, and water management. The existing research lacks information about how businesses in developing countries have changed their organizational structures. Global companies use their operational links between new energy projects and existing systems to create business advantages while local companies choose to maintain their main manufacturing processes during international market transitions (Andersen et al., 2025; Iheuwa et al., 2024; Pedersen et al., 2025).

The oil and gas sector functions in social and technical systems because existing fossil fuel systems experience their most difficult period which requires them to change into low-carbon energy systems (Hodge et al., 2025; Maissa et al., 2025). According to Legitimacy Theory companies use sustainability reports to achieve their strategic objectives while meeting social requirements which help them maintain long-term business operations and their right to conduct business (Eludu et al., 2016; Kiwi et al., 2025; Shaheen & Khan, 2025). This transition manifests in two forms: a shift toward unconventional resources (regime optimization) and a diversification into alternative energy (regime shift). While global companies hold the technical skills to create specialized green solutions their main target area remains unconventional oil and gas operations which help them obtain diminishing energy resources (Hasan, 2026; Qanas & Sawyer, 2025). The implementation of these changes demands complete transformations in Sustainable Supply Chain Management (SSCM) which need new systems to handle eco-friendly purchasing and water resources and carbon emissions management. The research field lacks sufficient studies about how indigenous businesses in developing countries such as Nigeria deal with external business pressures. Global organizations use operational synergies between their new energy projects and their current activities while indigenous companies encounter organizational limitations which require them to prioritize essential production processes instead of making significant changes to their supply chains (Eelager et al., 2025; Olabi et al., 2023; Peter & Ndinojuo, 2024; Raygoza-Limón et al., 2025).

The Nigerian Oil and Gas Supply Chain: A Dual-Segment Evolution

The Nigerian oil and gas supply chain consists of a complex network which includes multiple operators and contractors and suppliers who operate within two main industrial sectors which are called upstream and downstream (Olanrewaju et al., 2023; Olujobi, 2021). The Exploration and Production (E&P) upstream segment identifies and extracts crude oil and natural gas resources from Nigeria's extensive onshore and offshore petroleum resources. The oil sector division, which has always been controlled by National Oil Companies (NOCs) that NNPC Limited leads and IOCs, now faces systemic changes (Musa, 2022; Taylor, 2026). The indigenous companies have acquired onshore assets which NOCs previously sold to expand national petroleum reserves. The downstream segment utilizes the output from E&P activities to refine, market, and distribute petroleum products to domestic and business consumers (The Energy Year, 2024; The Nation, 2025). The Dangote Petroleum Refinery, which operates as the world's largest single-train refinery, creates a major transformation for this industry because it changes the distribution and transportation systems which currently depend on imported refined fuels from Nigeria (Adekoya & Oyebade, 2025; Extance & Arówólò, 2026). However, the supply chain faces intensifying "landscape" pressures from political and regulatory forces to operate sustainably. Strategic and structural changes are now required to ensure the industry remains resilient against environmental shifts (Adedokun, 2025; Shao et al., 2025). These include:

- **Sustainable Sourcing:** Integrating ESG clauses into supplier contracts and monitoring environmentally friendly practices, such as the chemicals used in hydraulic fracturing.
- **Production Efficiency:** Focusing on emissions reduction, water management, and the treatment of produced water to mitigate environmental damage.
- **Infrastructure Synergy:** Seeking alternative energy opportunities, such as biofuels, that create synergies with current O&G infrastructure and distribution systems.

The Nigerian supply chain requires a balance between its transition to deepwater sources and its shift to cleaner energy solutions in order to achieve international recognition and sustain its operations.

Decarbonization Pathways and Supply Chain Resilience

The decarbonization pathways function as strategic pathways which O&G companies use to decrease their carbon emissions while continuing to operate their businesses in a world that imposes stricter carbon limitations (Chrysikopoulos et al., 2024; Mujeeb et al., 2025). The Nigerian energy sector needs to implement two approaches which involve improving existing fossil fuel systems while adopting low-carbon technologies that operate in specialized market segments. Unlike a singular, abrupt transition, these pathways acknowledge that O&G will remain a primary energy source for decades. Consequently, the industry must become "harder to replace" by achieving extreme efficiency and demonstrating environmental compatibility. In the context of SSCM, these pathways manifest through four critical dimensions:

I. **Operational Decarbonization:** This focuses on reducing "Scope 1 and 2" emissions by improving the efficiency of production processes and ending routine flaring. Firms are increasingly concentrating efforts on technological developments that enable environmentally responsible energy production, ensuring they can meet demand while minimizing their carbon footprint (Romsom & McPhail, 2023; Yinbil, 2025).

II. **Product Evolution:** Many corporations are shifting their portfolios from high-carbon petroleum to natural gas. Natural gas serves as a vital transitional energy source for the natural gas industry because its lower carbon emissions make it possible for power plants to use natural gas as a coal replacement to reach 50 percent lower emissions (Dongo & Relvas, 2025; Herzog-Hawelka & Gupta, 2023).

III. **Supply Chain Circularity:** The adoption of "Reduce Reuse Recycle" (3R) frameworks helps companies to build resilience against challenges. This fact in water management is demonstrated by the demand for significant water resources for production and the need to manage production wastes in accordance with stringent rules (Atofarati et al., 2025; Kumar et al., 2026).

IV. **Technological Synergy:** Businesses want to develop new energy sources that can use their current oil and gas facilities together with their existing technology. The businesses achieve their energy transition goals by creating operational links between their existing business units which reduces their expenses on non-recoverable investments (Li et al., 2025; Švažas, 2026).

Thus, achieving a sustainable supply chain is not only about environmental contribution but also about the industry's ability to sustain itself and remain resilient against environmental and economic changes. The sustainable supply chain management (SSCM) practices of Nigeria's oil and gas industry apply international standards through their existing practices. According to studies, some Nigerian organizations have now become successful in decarbonizing (Abubakar, 2025; Bello, 2024; Akujor et al., 2025; Mujeeb et al., 2025). Nigerian domestic businesses face challenges as they must finish the intricate process of transitioning away from oil extraction. The transition requires local firms to obtain onshore oil assets which foreign companies have sold, creating major operational and strategic challenges for their business operations. Research shows that 37% of global energy companies address energy transition discussions in their corporate reports while Nigerian companies conduct their production operations as their primary business activity (Olujobi et al., 2023; Oyedepo, 2013; Shao et al., 2025).

The Nigerian operators use strategic resilience and environmental damage control methods to implement their sustainable practices according to research evidence (Adesua-Lincoln, 2025; Nwokolo et al., 2023; Ogunkan, 2022; Olujobi et al., 2023). The Nigerian market shows a strong focus on supply chain efficiency improvements while global companies shift their research efforts towards green technology development (Akinbamini et al., 2025; Mujeeb et al., 2025). The Nigerian market can achieve its best empirical synergy through biofuel integration, which uses current infrastructure and local agricultural supply chains.

The content analyses of sustainability reports demonstrate that 73% of companies report their supply chain management activities (Ferreira et al., 2025; Valenza

& Damiano, 2023), yet indigenous firms disclose supplier compliance information and green procurement practices at lower levels than their global counterparts (Kuruneri et al., 2026; Ogunsanya et al., 2022; Okafor et al., 2025). The Nigerian empirical narrative is currently dominated by "landscape" pressures such as regulatory shifts and community health risks, which force an opening in the traditional fossil fuel regime but often result in strategic rather than structural changes to the supply chain. The data demonstrates that Nigerian industry, while supporting a low-carbon future, continues to operate through the actual challenges of unconventional oil and gas development (Emodi & Boo, 2015; Robert, 2025).

Methods

The research utilizes qualitative content analysis to examine how energy transition affects sustainable supply chain management practices in the Nigerian oil and gas industry and global oil and gas operations. Sustainability reports are a great way to record and analyze information about oil and natural gas companies. This approach enables an understanding of how these firms strategically manage and communicate sustainability issues related to their logistics and supply chain activities. To ensure the inclusion of industry leaders in sustainability, financial performance, and production scale, a purposive sampling method was employed. The sample consists of 16 companies drawn from national listing. The selection methodology enables organizations to compare Nigerian organizations which have become key database users with major global companies operating in the country. These include the national oil company, NNPC Limited, Nigeria LNG Limited (NLNG), as well as domestic firms such as Seplat Energy, Oando, Aradel Holdings, Conoil, MRS Oil PLC, Sahara Group, Savannah Energy PLC, Chappal Energies and Heirs Energies, as well as international oil companies such as Shell, TotalEnergies, Eni, Chevron and ExxonMobil. The research selection enables complete assessment of sustainable supply chain methods which operate during the energy transition because it encompasses all structural elements present in the industry from global operators to transitioning multinationals and emerging local companies. The researchers collected data from the latest sustainability and corporate responsibility reports which mainly focused on the 2024 to 2025 reporting period. The comprehensive keyword search process was used to find data about oil and gas businesses' supply chain operations and energy transition initiatives. The keywords and thematic coding framework are summarized on Table 1.

Table 1. Keywords and thematic coding framework

Topic	Keywords
Energy Transition	Transition, shift, diversify, decarbonization, diversification, net-zero, energy mix
Energy Types	(Un)conventional, renewable, alternative, solar, wind, biofuel
Conventional O&G	Crude oil, petroleum, natural gas, onshore, offshore, joint venture (JV)
Unconventional O&G	Deepwater, shale gas, tight gas, bitumen, marginal fields
Alternative Energy	Biofuel, biomass, biogas, solar, wind, geothermal, hydrogen
Sustainable Supply Chain	Supply chain, logistics, distribution, supplier, procurement, transport

The collected statements were divided into three main functional areas of supply chain management which included supply management as well as production management and logistics management. The research examined how businesses describe their risk management practices and their strategic diversification efforts and their implementation of new energy technologies into their existing oil and gas

systems. The study compares how Nigerian businesses disclose their SSCM practices with the disclosure practices of international companies which are undergoing organizational changes (see Table 2).

Table 2. Functional SCM areas for content analysis

SCM Domain	Key Indicators for Analysis
Supply Management	Supplier selection/monitoring, sustainable sourcing, feedstock origin, local content compliance
Production Management	Emissions reduction, process efficiency, water management (recycling/treatment), safety and health risks
Logistics Management	Traffic safety, transport infrastructure, carbon footprint of distribution, road deterioration prevention

Results

The study results were obtained through a systematic content analysis which analyzed corporate disclosures of 16 selected oil and gas companies. The primary data sources included Sustainability Reports, Annual Reports and Impact Reports from 2023 to 2025, which served as primary data sources for the research. The following documents were the foundation for the theme coding and the ensuing generation of the Disclosure Index and Cross-Company Matrix:

Table 3. Oil and gas companies and sustainability data source

Company	Data Source
Aradel Holdings:	2024 Sustainability Report.
Nigeria LNG (NLNG)	2024 Facts and Figures (Annual Report) and Sustainable Development Policy.
Seplat Energy PLC	2025 Full Year Results and Sustainability Disclosures.
Shell plc	2025 Annual Report and 2023 Sustainability Report.
TotalEnergies	2024 Sustainability & Climate Progress Report.
Eni	2024 Sustainability Report (Eni for 2024).
ExxonMobil	2024 Advancing Climate Solutions Progress Report (Sustainability Report).
Chevron Corporation	2024 Sustainability Highlights.
NNPC Limited	2026 Gas Master Plan Report (Commercial Strategy Document).
Oando PLC	2024 Sustainability Report.
Sahara Group	2023 Sustainability Report.
Savannah Energy	2024 Annual Report and Accounts.
Heirs Energies	2024 H-Impact Report.
Conoil PLC	2023 Full Year Annual Report.
MRS Oil Nig. Plc	2024 Updated Annual Report.
Chappal Energies	2024 HSSE Policy and Asset Integration Framework.

The study employed a content analysis method to evaluate the Decarbonization Pathways of every organization. The analysis showed which goals O&G companies had established for two particular areas of their business operations. The comparative performance of these companies in each of the recognized SCM functional areas is described in depth in the following sections.

Table 4. Data Extraction Matrix: Energy Transition & SSCM

Company Name	RQ1: Transition Discourse	RQ2: Energy Types	RQ3: Supply Management	RQ3: Production Management	RQ3: Logistics Management
Aradel Holdings	"Core principle," "Energy transition evolves"	LPG, Solar mini-grids, Marginal fields	96.44% Local content, Vendor Code of Conduct	Zero routine flare by 2025, 90% fluid recycling, 22% energy reduction	N459.9M Road rehab, Carbon footprint tracking
NLNG	"Transitional energy," "Net Zero 2050"	LNG, LPG, Natural Gas Liquids (NGLs)	Nigerian Content (NOGICD Act), JV Gas Supply Agreements	47% Methane reduction, Zero methane ambition, Flare reduction	Global shipping fleet (BGT/NSML), Sea/Marine safety standards
Seplat Energy	"Transformational," "Energy powerhouse"	Gas (Oben/ANOH), Onshore/Offshore oil	Community development (PIA), Local talent development	24% Emissions reduction, End routine flaring by 2025	Bonny Terminal lifting, Pipeline security (TNP)
Chappal Energies	"Strategic integration," "Resilience"	Upstream O&G (via SPDC/NNPC JV assets)	Local content enforcement, Ethical supply framework	HSSE Policy focus, Operational restoration efficiency	Strategic restoration network, Asset security
Chevron	"Lower carbon future," "Scaling solutions"	Renewable fuels, Hydrogen, Carbon Capture (CCUS)	Global supply chain ESG standards, Methane clearinghouse	$10B carbon capital, Methane intensity reduction	Optimization of global shipping/routes
ExxonMobil	"Advancing climate solutions," "Net Zero"	Biofuels, Carbon Capture, Hydrogen	Global supplier ESG assessments, Sustainability audits	Scope 1 & 2 Net Zero by 2050, Flare reduction	Low-emission fuel logistics, Fleet efficiency

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NNPC Ltd	"Energy security," "Commercial entity"	Gas-to-Power, Crude Oil, CNG	PIA compliance, NOGICD Act enforcement	Flare out targets, Gas infrastructure expansion	Pipeline security, Downstream retail expansion
Heirs Energies	"Integrated impact," "Africa-led"	Upstream Oil/Gas, Clean cookstoves (LPG)	Africapitalism, 100% Local content focus	Operational efficiency, HSE excellence	Local infrastructure support, Community safety
Conoil PLC	"Value creation," "Market leader"	Lubricants, PMS, AGO, Jet A1	Local procurement for downstream assets	Facility safety, Storage efficiency	Retail station safety, Road transport standards
MRS Oil Nig.	"Strategic retail," "Operational excellence"	Refined products, Aviation fuel	Vendor management, Quality control	Depot safety, Storage tank optimization	Logistics fleet management, HSE in transit
Shell	"Accelerating the transition," "Net-zero by 2050"	LNG, Biofuels, Hydrogen, Wind/Solar	80% Supply Chain emissions focus, Supplier Energy Transition Hub	Carbon Capture (CCUS), Methane intensity <0.2%	Low-carbon shipping, EV charging infrastructure
TotalEnergies	"Multi-energy strategy," "Net Zero"	Integrated Power (Solar/Wind), Biogas, Hydrogen	"OneMAESTRO" supplier standards, Audit of critical vendors	30% reduction in Scope 1 & 2 by 2025, Flare elimination	Global LNG fleet optimization
Eni	"Just Transition," "Carbon Neutrality 2050"	Biorefining, Fusion energy (R&D), Renewables	"Sustainable Supply Chain" platform, ESG supplier scoring	Zero routine flaring by 2025, Forest conservation (REDD+)	Circular economy in logistics
Seplat Energy	"Energy powerhouse," "Nigeria's energy transition"	Natural Gas (ANOH/Oben), Onshore Oil	Community host funding (HCDT), 98% Local content	24% emissions intensity reduction, Flare-out by 2025	New gas pipeline infrastructure

Oando PLC	"Sustainable energy future," "Resilience"	Gas-to-Power, Solar (Oando Clean Energy)	Strategic JV partnerships, Local capacity building	Operational efficiency, HSE excellence	Sustainable distribution networks
Sahara Group	"Energy abundance," "Sustainable growth"	Power generation (Gas/Hydro), Upstream	Strategic procurement, Community impact	Asharami Square (HSE), Carbon footprint tracking	Logistics safety, Asset integrity
Savannah Energy	"Projects that matter," "Renewable transition"	Gas-to-Power, Wind, Solar, Hydro	Local supplier development, Ethical sourcing	Efficiency in gas processing, High HSE standards	Pipeline distribution in SE Nigeria

The data extraction matrix reveals a distinct divergence in how global and indigenous oil and gas firms integrate energy transition pressures into their Sustainable Supply Chain Management (SSCM). Shell, Eni, and TotalEnergies use their Net Zero and Energy Shift initiatives to guide their supply chain operations toward a multi-energy system, leveraging advanced hydrogen and carbon capture and utilization (CCUS) and biofuels technologies. The company establishes supply chain control through its advanced digital environmental, social, and governance (ESG) platforms, which evaluate vendors worldwide while decreasing operational emissions associated with Scope 3 emissions. The indigenous Nigerian group led by Seplat Aradel and NNPC Ltd sees Energy Security and a Just Transition as their most essential objectives. The organization decarbonizes its operations by using natural gas as its primary decarbonization method, implementing the Gas-to-Power system to convert it into a cleaner alternative to local energy sources that produce higher emissions. Oil and gas companies choose to assess their operations through local content compliance and community legitimacy instead of using international environmental, social, and governance ESG benchmarks. To meet its responsibilities under the Petroleum Industry Act PIA, Aradel and Seplat both maintain domestic spending rates of 96.44% and 98%, respectively. The dispute settlement procedure requires all involved parties to work together because they share the goal of eliminating regular flaring operations by 2025 and 2030. Indigenous enterprises lead the field of Supply Chain Circularity because Aradel recycles 90% of its drilling fluids, which competes with the circular economy goals of multinational companies. A look at the disclosure index reveals more insight

Table 5. Comparative Disclosure Index (0–1 Scale)

Company Classification	**Supply Management**	**Production Management**	**Logistics Management**	**Overall Mean Score**
Global Majors (Avg.)				
Shell, TotalEnergies, Exxon, Chevron, Eni	0.95	1.00	0.85	0.93
Indigenous Majors (Avg.)				
Seplat, Aradel, Oando, Sahara, Savannah	0.90	0.80	0.75	0.82
National Champions				

NNPC Limited, NLNG	0.70	0.75	0.60	0.68
Independent/Downstream				
Heirs, Conoil, MRS, Chappal	0.50	0.55	0.65	0.57

The Comparative Disclosure Index shows Sustainable Supply Chain Management (SSCM) reporting at different levels, which Global Majors achieved the highest score of 0.93. Multinational oil companies achieve their best operational performance through continuous evaluation, which establishes an efficiency limit of 0.95. Digital technologies for ESG now enable complete digital access to all Scope 3 audits, which helps speed up the development process of auditing procedures. Indigenous Majors show strong performance in this area with a score of 0.90 because Nigeria's NOGICD Act forces them to report their detailed domestic spending according to its reporting rules. The most transparent field of operation across all fields of study appeared in Production Management. The official audited reports document the flaring reduction and emission intensity decrease achievements of both Global Majors and Indigenous Majors which have been made available to the public. Meanwhile, National Champions NNPC Ltd improved their score from 0.75 by increasing the transparency of their commercial and operational disclosures. Conversely, Logistics Management remains the most significant "under-reported" domain, with a low mean score of 0.71. Aradel allocated the sum of N459.9 million to a road rehabilitation project, while it is still focusing on improving infrastructure development. Most O&G firms do not give detailed carbon footprint measures for their distribution fleets, the corporations rely mostly on qualitative claims regarding transit safety to report on safety. The index suggests that firms with higher exposure to environmental, social, and governance (ESG) factors are more likely to maintain transparent supply chain operations.

Table 6. Cross-Company Content Analysis of Energy Transition and SSCM

Company	Energy Transition	Energy Types	Conventional O&G	Alternative Energy	Supply Mgmt	Production Mgmt	Logistics Mgmt	Overall SSCM
Shell Plc	5	5	4	5	5	5	4	4.8
TotalEnergies	5	5	4	5	5	5	4	4.8
Eni	5	5	4	5	4	5	4	4.6
Chevron	4	4	5	3	4	4	4	4.0
ExxonMobil	4	4	5	3	4	4	3	3.9
Seplat Energy Plc	4	4	5	2	4	4	3	3.7
Savannah Energy	4	4	3	4	3	4	3	3.6
NLNG	4	4	4	1	4	4	4	3.6
Aradel Holdings	3	3	5	2	4	4	3	3.4
Sahara Group	3	3	5	2	3	3	3	3.1
Oando Plc	3	3	5	2	3	3	2	3.0

NNPC Limited	2	2	5	1	3	3	2	2.6
Heirs Energies	2	2	5	1	3	3	2	2.6
Conoil Plc	1	1	5	0	2	2	2	1.9
MRS Oil Nig. Plc	1	1	5	0	2	2	2	1.9
Chappal Energies	1	1	5	0	2	2	1	1.7

Note:

Score		Meaning
0	=	Not mentioned
1	=	Minimal mention
2	=	Moderate discussion
3	=	Strong discussion
4	=	Extensive
5	=	Comprehensive / strategic

The research examines how different companies combine energy transition practices with their Sustainable Supply Chain Management (SSCM) operations through three distinct levels of integration. The three companies Shell, TotalEnergies and Eni operate as top global industry players because their rating system shows they achieved scores between 4.6 and 4.8 through their implementation of advanced multi-energy strategy systems which operate hydrogen and biofuel technology for their supply chain management. International oil companies tend to achieve greater compliance with international transition criteria by adopting contemporary ESG scoring systems that evaluate their vendor networks. Seplat Energy and Aradel Holdings, which are the native standards for Nigeria, achieve better ratings than their regional competitors with scores of 3.7 and 3.4. Aradel achieves exceptional production management results through its verified achievements which include a 22.0% reduction in energy consumption and a 90.0% recycling rate for drilling fluids. The world energy companies are making progress toward renewable energy sources yet the Nigerian companies NNPC Ltd and Heirs Energies continue to focus on "conventional O&G" operations because they require those activities to maximize their divested onshore resources while developing domestic energy solutions through gas-to-power initiatives. The sixteen companies show their weakest disclosure performance in logistics because they typically do not provide specific carbon footprint information despite their general statements about transit safety.

Discussion

The content analysis results show that the energy transition discourse evolved from a minor ESG issue into a "business imperative" that all 16 companies needed to address. The different types of discourse used by companies display a major difference which results from their geographic and economic "landscape." The Global Majors Shell TotalEnergies and Eni show full transition discourse integration through their Content Analysis Matrix which earns them a constant 5 score. The company reports use a "Net Zero" narrative to present their transition as a complete Sociotechnical Transition or "regime shift." The research conducted by Kuyoro et al. (2023) proves that Western companies must achieve decarbonization targets to keep their investors satisfied. The companies use advanced sustainability

reporting systems according to Legitimacy Theory to preserve their operational rights during the period of stringent Western regulations which mandate extensive decarbonization efforts. In contrast, the discourse among Indigenous Nigerian firms like Seplat Energy, Aradel Holdings, and NNPC Ltd is framed through the lens of "Energy Security" and a "Just Transition." While Seplat (Score 4) and Aradel (Score 3) acknowledge the global "energy transition evolves" narrative, their discourse is primarily a "regime optimization" strategy. The companies establish their transition path by selecting natural gas as their bridge fuel which will substitute all local high-emission biomass and diesel operations. This reflects the findings of Arezki and Senbet (2017), who argue that for emerging economies, the transition must be balanced against the urgent need for domestic energy access. The Nigerian regime is responding to "landscape" pressures by making existing oil and gas infrastructure "harder to replace" through extreme operational efficiency and gas-to-power initiatives, rather than a total shift to renewables.

The Disclosure Index results establish the existing transparency gap which shows that Indigenous organizations score 0.82 while Global Majors achieve 0.93 with their nearly perfect transition transparency. According to Adelopo et al. (2024), the research shows that there is a transparency gap since developing market companies prioritize local socio-economic consequences above typical worldwide ESG measuring methods. The discussion for Heirs Energies and NNPC Ltd as Indigenous firms centers on "Africa-led" approaches which study how energy abundance affects African economic growth through Africapitalism rather than studying net-zero technical details which ExxonMobil and Chevron emphasize. The reports identify "Decarbonization Pathways" which show Global Majors address "Scope 3" emissions with their entire supply chain carbon footprint emissions while Nigerian companies concentrate on Scope 1 and 2 emissions by stopping routine flaring and enhancing process efficiency. The transitional nature confirms that different contexts create distinct transition pathways which Global Majors use to develop their energy portfolio while Nigerian companies use "greening" methods to make their supply chains more resilient to environmental regulation shifts and to establish permanent institutional legitimacy.

The second research objective is addressed by the results of the content analysis, the Cross-Company Matrix (Table 6) reveal a stark divergence in energy prioritization between Global Majors and Indigenous Nigerian firms, a finding that directly reflects the Sociotechnical Transition Framework discussed in the literature. The global companies Shell TotalEnergies and Eni received frequent 5 ratings in the "Alternative Energy" section of their assessment. Their reports emphasize a major "regime shift," which includes significant investments in specialized breakthroughs like hydrogen, biofuels, and offshore wind. As noted by Kuyoro et al. (2023), these firms are leveraging their immense capital to lead the global decarbonization movement, transitioning from "oil companies" to "energy companies." This shift is not merely environmental but a survival strategy to remain resilient in a global landscape where fossil fuel "regimes" are under existential threat from climate policy and shifting investor sentiment. Conversely, the data for Indigenous firms like Seplat, Aradel, and NNPC Ltd indicates a prioritization of "regime optimization" over radical shift. The businesses achieved superior performance in both "Conventional O&G" and "Unconventional O&G" compared to their results in "Alternative Energy" which received a score between 1 and 2. Arezki and Senbet's (2017) arguments on the particular energy requirements of rising countries are consistent with this prioritizing. For these operators, the "Gas-to-Power" pathway provides the foundation of long-term resiliency. Natural gas is marketed as a "bridge fuel" or "game changer" that has a smaller carbon footprint than coal or diesel and offers the energy density required to propel Nigeria's development. This strategy reflects a pragmatic response to the "landscape" pressures identified in the literature, where indigenous firms must balance global emission standards with the localized mandate for energy security and economic development.

Furthermore, the prioritization of Unconventional O&G—specifically deepwater assets and marginal fields—is a dominant theme for Nigerian firms. As Adelopo et al. (2024) suggest, the divestment of onshore assets by International Oil Companies (IOCs) has created a "transition" of ownership rather than an immediate transition of energy type. Firms like Aradel Holdings and Heirs Energies are utilizing these

assets to bolster national reserves, ensuring that the existing fossil fuel infrastructure remains "harder to replace" by maximizing its efficiency and environmental compliance. While Savannah Energy (Score 4) and Oando Clean Energy are demonstrating rising commitments to renewables like as solar and hydro, the wider indigenous cluster remains focused on gas-led decarbonization. This divergence underscores a critical finding: resilience for Global Majors is defined by diversification into carbon-neutral niches, whereas for Nigerian Indigenous firms, resilience is defined by optimizing the gas value chain. The Legitimacy Theory application receives validation through this distinction because Global Majors use green innovation to achieve legitimacy with their international stakeholders while Indigenous firms achieve legitimacy through their domestic economic contributions and "Energy Abundance" in accordance with the Africapitalism principles outlined in academic research.

The third research objective shows that energy transition pressures are transforming Sustainable Supply Chain Management (SSCM) through their effects on all 16 companies, but the execution shows the Sociotechnical Transition "regime" versus "niche" divide. Digital ESG platforms enable Shell and Eni to audit their "Scope 3" emissions which demonstrates their transition towards "Supply Chain Accountability" according to their global major status. Western companies use green procurement practices to sustain their Legitimacy Theory standards according to the findings of Kuyoro et al. (2023). Aradel and Seplat focus on "Production Management" through their operational circularity which includes 90% drilling fluid recycling and a commitment to stop routine flaring by 2025. Adelopo et al. (2024) report that local companies use "greening" of their fossil fuel systems to achieve resilience against domestic "Gas-to-Power" standards. The "under-reported" area of logistics remains unexplored while Aradel spends N459.9 million on road infrastructure, most companies do not have detailed carbon information for their distribution fleets. Arezki and Senbet (2017) state that Nigeria requires SSCM to provide energy security through linked local supply chains which entails more than decarbonization efforts.

Policy Recommendations

To ensure a resilient and sustainable energy transition within the Nigerian context, the following policy actions are recommended:

1. Harmonize ESG Reporting Standards: A single ESG disclosure methodology that is specific to the Nigerian "Gas-to-Power" route should be created by the Nigerian Exchange Group (NGX) and the Nigerian Upstream Petroleum Regulatory Commission (NUPRC). This would go beyond general worldwide measures and incorporate particular indicators for gas-to-domestic-market ratios, local content value-add, and energy access.

2. Incentivize Supply Chain Circularity: Government policies could offer tax benefits and green certifications to indigenous businesses which achieve 90% circularity through their operations according to Aradel's drilling fluid recycling method. The implementation of waste-to-energy and water recycling systems at production facilities will decrease environmental damage which occurs during the transition from traditional operations.

3. Mandate Logistics Decarbonization Tracking: Given that logistics is the most underreported subject, the Federal Ministry of Environment should require the recording of carbon footprints for distribution fleets. Policies should encourage the transition of heavy-duty haulage from diesel to Compressed Natural Gas (CNG) to create immediate synergies between the gas transition and logistics management.

4. Support "Niche" Renewable Integration: The Rural Electrification Agency (REA) should partner with indigenous oil majors to scale solar mini-grid pilots. The companies can establish social legitimacy through "Just Transition" implementation by utilizing existing oil field security and technical resources to supply energy needs of their host communities.

Conclusion

This study has provided a comprehensive comparative analysis of how energy transition pressures are

reshaping SSCM within the global and Nigerian oil and gas sectors. In order to demonstrate how businesses have a significant "transparency gap" and select various decarbonization strategies, the study examined sixteen distinct corporate entities. Global Majors use their extensive financial resources to establish complete organizational transformation through hydrogen and biofuels development and their "Net Zero" multi-energy system projects while Indigenous Nigerian firms use practical methods to enhance their operational processes. The "Gas-to-Power" bridge, which attempts to meet environmental criteria while meeting local demands for energy security and economic growth in accordance with Africapitalism ideals, is how the local stakeholders in this region characterize their transition process. The study found that production management through ongoing flaring and fluid recycling operations functions as a standard industry requirement while logistics management remains unrecognized because it receives the smallest reporting volume across the entire sector. Legitimacy Theory receives validation from study results as Global Majors use green innovation for international stakeholder demands, while Nigerian firms build institutional legitimacy through their local content adherence and infrastructure investments. The Nigerian energy sector will achieve resilience in 2030 by transforming its current fossil fuel infrastructure into environmentally friendly systems while introducing specialized renewable energy technologies.

Conflict of Interest

We certify that there is no conflict of interest with any financial, personal, or other relationships with other people or organization related to the material discussed in the manuscript.

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