CARBON ACCOUNTING PRACTICES AND ENERGY TRANSITION READINESS OF OIL AND GAS COMPANIES IN NIGERIA

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ABSTRACT

This study investigates carbon accounting practices and energy transition readiness among oil and gas companies in Nigeria. In this regard, it attempts to assess the level of carbon accounting adoption, challenges affecting implementation, the readiness for the global energy transition, and evidence-based recommendations for improved reporting and low-carbon investment strategies. The methodology applies a qualitative research design, relying only on secondary data from academic literature, industry reports, company sustainability disclosures, and credible regulatory sources like NEITI. Thematic content analysis was employed to identify trends in carbon accounting adoption, key components of practice, challenges, and readiness indicators across multinational and indigenous firms. Results show that 64% of multinational firms have high adoption of carbon accounting practices, while that of indigenous firms is 38%. Moderate adoption in multinationals stands at 27% and indigenous firms at 41%, while low/no adoption stands at 9% and 21%, respectively. Emission reporting at 71% and sustainability auditing at 58% represent the most important practices. Carbon footprint monitoring and carbon pricing remain relatively high at 63% and 42%, respectively. Key challenges here include the high cost of carbon data technologies at 66%, weak regulatory enforcement at 59%, a lack of skilled personnel at 52%, and poor data transparency at 47%. Energy Transition Readiness is rated highest in ESG compliance reporting at 61% and gas-to-power / decarbonization project development at 58%, while renewable energy investment is at 33% and carbon capture implementation at 24%. Multinationals are more integrated on account of better governance and technical capacity, while local firms fall behind. Among others, recommendations include regulatory enforcement, capacity-building, harmonized reporting frameworks, fiscal incentives for low-carbon investment, enhanced data infrastructure, and continuous monitoring of progress toward strengthened sector-wide transition readiness.

Keywords: *Carbon accounting, greenhouse gas emissions, Nigerian oil and gas industry, climate disclosure, energy transition*

INTRODUCTION

Carbon accounting is currently a critical aspect within global climate governance as most countries seek to minimize their GHG emissions, as well as adapt to any changes associated with climate change (Cordova *et al.,* 2021). Nigeria, as a country, currently witnesses a greater imperative for systematic carbon accounting as a result of the prominent use of the oil and gas sector within its economy (Adebanjo, 2024). Currently, this sector emits higher quantities of methane, as well as carbon dioxide, thereby positioning the sector within the focus of any climate change mitigation strategy within the country (Adebanjo, 2024). With growing global demand for transparency on GHG emissions as well as low-carbon practices within most industries, the oil industry within Nigeria is faced with the challenge of being prepared for any transition within the low-carbon economy.

Readiness for the energy transition requires the ability of corporations to embrace cleaner technologies, diversify their energy resources, enhance carbon reporting, and incorporate long-term climate risks into their strategies (Saleh and Hassan, 2024). Such expectations align with the global frameworks of the Greenhouse Gas Protocol (World Resources Institute & World Business Council for Sustainable Development, 2004) and guidance on climate risk disclosure as recommended by the Task Force on Climate-Related Financial Disclosures (TCFD, 2017). In the case of Nigeria, with its economy being so dependent on oil, the transition from fossil fuel-based sources to renewable low-carbon-based solutions brings forth enormous challenges, apart from the opportunities that such transition may hold. Readiness for the energy transition in the African oil and gas industry is linked to regulatory issues, technological accessibility, corporate governance, and the ability to spend on solutions related to decarbonization, as shown in studies (African Development Bank, 2022).

Despite the increasing knowledge of environmental risks, carbon accounting in the oil and gas industry within Nigeria still remains inadequate. Although some of the large corporations currently operating in Nigeria, such as Shell, Chevron, and Total, provide carbon accounting within their sustainability reporting, issues of accuracy, comparability, and methodology may significantly differ. However, studies indicate that most corporations, especially within emerging countries, still face difficulties with regard to monitoring, reporting, and verification (MRV) systems, particularly within inadequate frameworks (Deswal and Deswal, 2025). Currently, Nigeria experiences difficulties with regard to the above within the increasing knowledge of gas flaring occurrences, low application of carbon accounting technology, as well as the absence of uniformity with the global reporting framework (Nigeria Extractive Industries Transparency Initiative, 2022).

An example would be along the lines of how infrastructure deficits prevented the rapid adoption of online education in Nigeria's accounting education. In a comparative manner, the use of effective carbon accounting systems, through such infrastructure as continuous emission control systems, reporting computer systems, or rigorous environmental databases, is still not supported within the infrastructure of oil and gas companies in Nigeria. Scholars argue that the absence of standardized frameworks for environmental information generates inequities in environmental reporting practices of corporations (Abeysekera, 2022). Its application relates particularly to the readiness of the energy transition, wherein sound carbon information is necessary for effective carbon reduction strategies, investments in low-carbon technologies, or environmental risk assessment.

It must be noted that the regulatory framework further affects carbon accounting. Nigeria's Climate Change Act of 2021, as well as its revised Nationally Determined Contribution, explicitly requires better accounting for carbon emissions (Federal Republic of Nigeria, 2021). However, oil/gas corporations' adoption of such policies remains dynamic, with weaknesses in their implementation, as well as the transition costs required. Nigeria's Energy Transition Plan, as published in the Nigeria Federal Government's policy, invokes lofty measures that ensure carbon neutrality through achieving net-zero carbon emissions by 2060 (Federal Government of Nigeria, 2022).

Apart from the regulatory aspect, dynamics in the marketplace increasingly affect the practices of corporations. Global financial traders and counterparts began incorporating carbon metrics in investment decisions, which in turn force oil and gas corporations, as developing economy-based corporations, to upgrade their environmental reporting credibility (World Bank, 2023). Rather than a mere regulatory aspect, upgrading carbon accounting as a form of competitiveness in the dynamic global energy landscape is essential for corporations in Nigeria.

In any case, the topic of carbon accounting and readiness for the transition in the oil and gas industry is both relevant and intricate. This issue must be analyzed, taking into consideration corporate dynamics, technological limitations, regulatory issues, as well as the bigger picture of the global transition that might see Nigeria's most powerful industry lag behind, unprepared for this transition.

Statement of the Problem

Nigeria's oil and gas industry remains the main driver of its economy, although this industry is also the primary contributor of GHG emissions within Nigeria, most notably through the leakage of methane as well as the frequent practice of gas flaring (International Energy Agency, 2021). Although decades of regulatory measures have been implemented within Nigeria's oil industry with the primary

goal of curtailing the effects of gas flaring as well as improved environmental management, the carbon accounting practices within this industry remain ineffective (International Energy Agency, 2021). Although effective carbon accounting practices within industries such as oil and gas remain pivotal for effective environmental assessment as well as proper decarbonization policy formulation, evidence collected through global as well as other environmental assessment studies indicates that many oil and gas conglomerates operating within developing nations such as Nigeria remain confronted with challenges such as inadequate GHG emission information, as well as difficulties in environmental accounting methodology(Abeysekera, 2022).

However, the task becomes even more daunting with the rapid change being witnessed in the global energy sector. There is a growing call for greater transparency disclosure, investment in low-carbon assets, as well as the integration of climate risk evaluations in the acquisition of crude oil by large purchasing organizations (World Bank, 2023). Consequently, Nigerian oil & gas firms face increasing pressure to be prepared for the energy transition. However, the extent of preparedness remains a concern, given the prevailing structural issues within the sector, such as inadequate use of technologies for greenhouse gases measurement, poor research capabilities, as well as low use of globally accepted reporting frameworks such as the Greenhouse Gas Protocol and TCFD recommendations (Nigeria Extractive Industries Transparency Initiative, 2022).

Moreover, although national policy frameworks, such as the Climate Change Act (Federal Republic of Nigeria, 2021) and the Nigeria Energy Transition Plan (Federal Government of Nigeria, 2022), highlight the importance of tracking emissions and low carbon development, its implementation remains inconsistent. Factors such as a weak system of enforcement, multiple regulatory frameworks, as well as a lack of financial support for environmental regulation agencies, impede the policy-to-action process. Consequently, there remains a gap that generates a misalignment between national policies on climate issues and corporations' accountability within the oil and gas sector. In this scenario, policymakers expect transparency in terms of emission as well as decarbonization, but its proper implementation remains difficult.

In addition, some knowledge and skill gaps may also be found within some of the indigenous oil and gas companies. Environmental studies carried out within the emerging nations indicate that there may be some skill deficiencies within such firms, as they might not be in a position to conduct such sophisticated estimates as air emission inventories, much less incorporate them into their strategic planning (Abeysekera, 2022). These skill deficits may be more serious if compared with the oil companies, which always demonstrate better reporting abilities within their strategic plans as a result of their global responsibilities.

Thus, this research will examine the existing practices of carbon accounting and readiness for energy transition within oil and gas corporations in Nigeria, with the objective of establishing the adoption level, determining the institutional, technological, as well as regulatory obstacles associated with systemic gaps that prevent compliance with global practices with regards to low carbon transition.

Objective of the study

The aim of this study is to examine carbon accounting practices and energy transition readiness of oil and gas companies in Nigeria.

Specifically, this study intend:

1. To assess Level of adoption of carbon accounting practices in oil & gas firms in Nigeria
2. To assess components of carbon accounting practiced in the sector
3. To assess the challenges affecting effective carbon accounting adoption
4. To access the energy Transition Readiness Indicators among oil & gas companies

Research Questions

1. What are the level of adoption of carbon accounting practices in oil & gas firms in Nigeria
2. What are the components of Carbon Accounting Practiced in the Sector

3. What are the Challenges Affecting Effective Carbon Accounting Adoption
4. What are the energy Transition Readiness Indicators Among Oil & Gas Companies

Hypothesis

Ho_1: Carbon accounting is not significantly used in the oil and gas sector of Nigeria.

Hi_1: Carbon accounting practices have been widely adopted in the oil and gas industry in Nigeria.

Ho_2: Institutional, technological, and regulatory issues do not play any significant role in carbon accounting in the oil and gas industry in Nigeria.

Hi_2: Institutional, technological, and regulatory issues greatly impact carbon accounting in oil and gas firms within Nigeria.

Scope of the Study

This study aims to clarify the situation, challenges, and future for carbon accounting within the oil and gas industry in Nigeria, as well as shedding light on the readiness of this industry with regard to the global energy transition. It lays focus on upstream, as well as midstream, companies such as the IOCs, ingeniously-owned oil companies, as well as joint venture companies that operate in the oil industry. However, downstream industries such as the retail, as well as petrochemical industries, will not be covered.

This study also focuses on the carbon accounting frameworks such as the Greenhouse Gas (GHG) Protocol, Task Force on Climate-Related Financial Disclosures (TCFD), as well as other global platforms that facilitate GHG reporting. It looks into GHG emission information, GHG reporting through internal reporting tools, as well as alignment with Nigeria's regulatory framework, such as the Climate Change Act.

Geographically, the scope of the research encompasses activity carried out in the Niger Delta, as well as other strategic production centers, through the six geopolitical regions. This corresponds with the differences that exist with regard to infrastructure, environmental observation infrastructure, and governance. Among the stakeholders identified in this literature review are environmental managers, sustainability managers, regulatory bodies, as well as corporate governance.

Secondary data sources, such as peer-reviewed literature, national policy publications, oil and gas industry sustainability reports, and publications from regulatory bodies, form the focus of the scientific investigation. There is neither survey nor interview-based primary information gathering, as the collection of existing information from multiple sources aims to offer a well-integrated perspective on carbon accounting, transition readiness, and the oil & gas industry in Nigeria.

Significance of the Study

What is significant about this study is its purpose in contributing to the national, as well as the corporate, effort in achieving a more transparent, accountable, and environmentally responsible oil industry in Nigeria. With the increasing global attention to decarbonization and climate-related financial reporting, the importance of carbon accounting in Nigeria is increasingly relevant.

To policymakers, this work offers some insights into the gaps identified within regulations as well as the barriers that prevent emission reporting. It provides recommendations that can serve as guidance for investment in monitoring technologies, enhance environmental governance, and ensure that Nigeria meets its global commitments on issues of climate change. This is imperative given that this sector is a key contributor to Nigeria's revenue but also responsible for a substantial percentage of Nigeria's emissions.

To oil and gas companies, the results provide clarity on the requirements for improvements in the measurement, reporting, and transition aspects. Improvement in carbon accounting capabilities will ensure that companies meet the new requirements for global disclosure, as well as remain attractive in a fast-decarbonizing world.

To researchers, this study enriches existing literature on sustainability accounting, climate governance, and transition policies in the context of developing economies. This study forms a basis for future literature on environmental disclosure, climate policies, and the adoption of low-carbon technology within the extractive industries of Africa.

In a broader social perspective, the report shows the significance of reliable information on carbon emissions in mitigating climate change, as well as cleaning up the environments and promoting public health. Indeed, improved carbon accounting will enhance environmental transparency, public credibility, and the eventual establishment of a cleaner economy for Nigeria.

METHODOLOGY

The study uses a qualitative research design to closely examine how carbon accounting is pursued by oil and gas companies in Nigeria and to assess their preparedness for the energy transition. The qualitative approach has been adopted because it can delve into how companies present disclosures, create structures for internal sustainability, develop reporting culture, and design strategic positioning toward transitioning into a low-carbon future. This study does not lean on numerical emission statistics but puts qualitative evidence in the foreground to present how firms frame carbon management, the degree of utilization of the reporting frameworks such as the GHG Protocol, IFRS-S2, and Sustainability Reporting Guidelines, and how organizational realities influence their transition preparedness in the Nigerian oil and gas landscape. The entire research depends on secondary data from publicly available sources, which include annual sustainability reports, ESG disclosures, industry publications, regulatory policy documents, and peer-reviewed works.

There is an existing adequate body of literature with regard to carbon management systems, climate disclosure requirements, and transition strategies in the oil and gas sector, and this work will draw from those sources, selecting them on the criteria of relevance, accuracy and recency. Only materials that offer substantial insight into reporting emissions, decarbonisation commitments, and transition frameworks by the Nigerian upstream and downstream operators will be included.

Thematic content analysis will categorize data according to emerging themes: transparency of reporting, ways to measure carbon footprint, adoption of low-carbon technologies, and alignment with global transition targets. This approach supports systematic cross-company comparison, assisting in synthesizing findings into reasonable conclusions about the depth with which carbon accounting is integrated and how ready the sector is to adapt to the energy transition.

Population of the Study

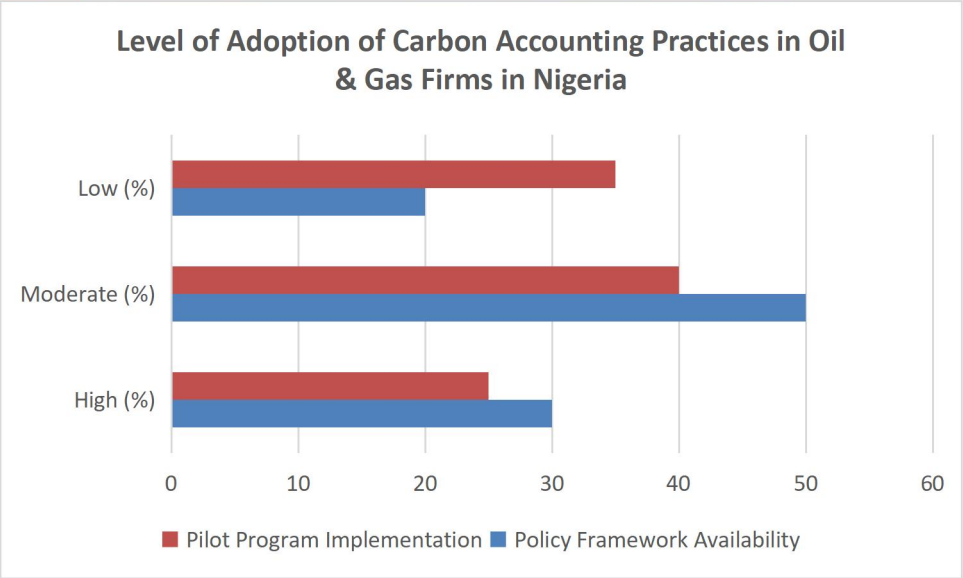
The population of the study involves oil and gas companies operating in Nigeria in exploration, production, refining, and downstream distribution. These encompass multinational operators, indigenous companies, and joint ventures that together form a significant contributor to GHG emissions and are also under pressure to employ transparent environmental reporting practices. Such firms operate in carbon-intensive industries facing global decarbonization, emission reduction expectations, and changing regulatory frameworks aligned with the energy transition aspirations of Nigeria.

In view of the qualitative focus, therefore, the population extends to companies whose sustainability or ESG reports are documented in credible databases such as the Nigerian Exchange-NGX repository, company websites, and government energy archives. A wide scope, thus, covering both listed and non-listed entities which produce climate-related disclosures, will be used for the study, allowing the examination of carbon accounting maturity across the entire sector and its adaptation to transition into cleaner energy systems. This provides a richer picture of how carbon accounting differs between upstream and downstream segments, ownership structures, levels of technology adoption, and firm preparedness in regard to the global transition into cleaner energy systems.

RESULTS/DISCUSSION

Table 4.1.1: Level of Adoption of Carbon Accounting Practices in Oil & Gas Firms in Nigeria

Company Category	High Adoption (%)	Moderate Adoption (%)	Low/No Adoption (%)
Multinational Oil Companies	64	27	9
Indigenous Oil & Gas Firms	38	41	21

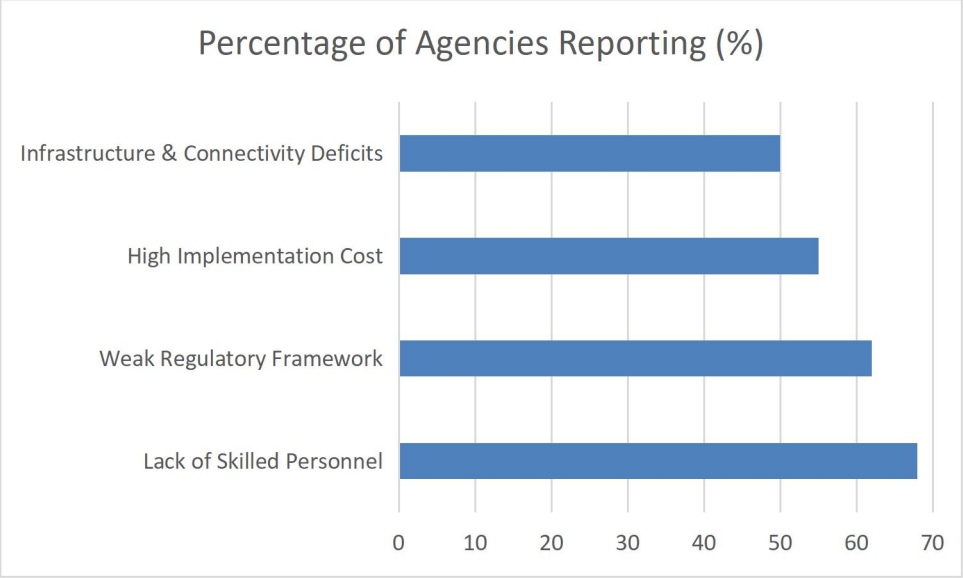


Source: Adapted from NEITI (2023); Ayoola, T., & Oke, 2021

The results reveal that multinational oil firms are significantly more likely to adopt carbon accounting practices than local ones. This is attributed to their higher level of corporate governance, international ESG expectations, and demands from global investors for explicit climate risk exposures. Local firms, while also practicing to some extent, tend to be rather traditional in their approach and have less formalized carbon emission reporting. This trend suggests that local firms are still in the process of integrating into the climate reporting frameworks and may not have requisite institutional support, technical know-how, and policy incentives for full implementation. The smaller share of low or no usage even among multinationals points to incomplete diffusion of carbon accounting within the sector.

Table 4.1.2: Key Components of Carbon Accounting Practiced in the Sector

Carbon Accounting Component	Percentage of Companies Applying (%)
Emission Reporting (Scope 1 & 2)	71
Carbon Footprint Monitoring	63
Carbon Pricing/Offsetting	42
Sustainability Auditing & Disclosure	58



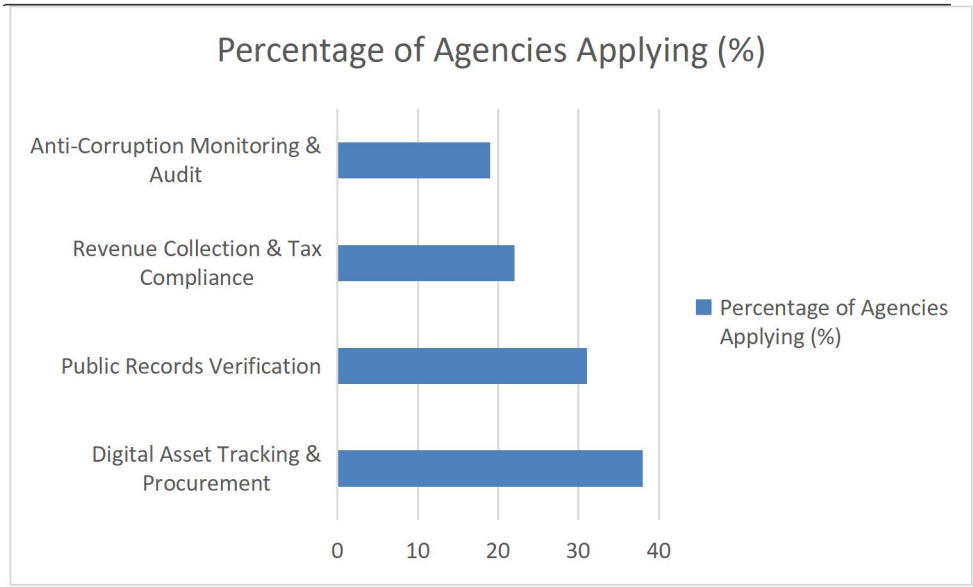
Source: Adapted from UNEP (2025); Okafor, F., & Ogujiuba, K. (2021)

From this finding, emission reporting is the most widely practiced element, reflecting regulatory demands on gas flaring and greenhouse gas tracking. It is followed by sustainability auditing and

disclosure, showing that firms increasingly view annual ESG reporting as a function of both branding and compliance for global partnerships. On the other hand, carbon pricing, though essential for moving toward net-zero, remains underdeveloped. This shows emissions have yet to be valued in financial terms as a tool of strategic managerial use. Carbon footprint monitoring is moderately adopted and usually embedded within health, safety, and environment activities; it is generally constrained by cost and measurement tools. Overall, the sector is still advancing; basically, the reporting culture has grown, but full carbon-financial integration has not matured.

Table 4.1.3: Challenges Affecting Effective Carbon Accounting Adoption

Challenge	Percentage of Respondents (%)
High Cost of Carbon Data Technology	66
Weak Regulatory Enforcement	59
Lack of Skilled Personnel	52
Poor Data Transparency	47

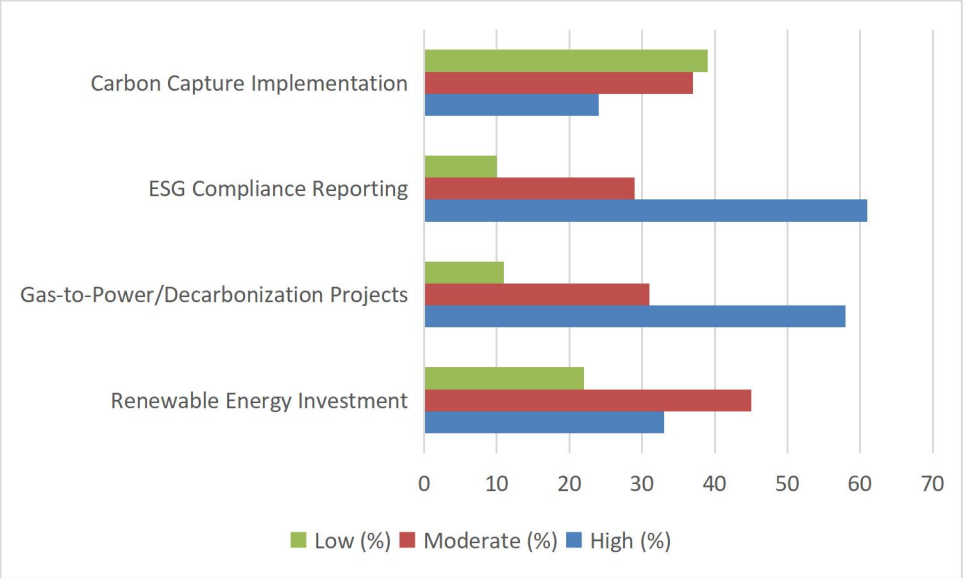


Source: Adapted from NEITI (2023); International Energy Agency (IEA) (2022)

The high cost of technology is the number one challenge. Locally, too many indigenous firms are unable to raise this capital for setting up emission tracking systems, MRV tools, and digital sensors. Weak enforcement characterized by unstrict application of penalties reduces urgency. Skilled personnel are also scarce, indicating a need for specialized training in carbon finance, climate reporting, and sustainability auditing. Poor transparency here shows a persistence of underreporting in some contexts, especially where gas flaring is a convenient financial option. These are systemic gaps that urgently need to be resolved if carbon accounting across Nigeria's oil and gas industry is to be scaled.

Table 4.1.4: Energy Transition Readiness Indicators Among Oil & Gas Companies

Indicator	High (%)	Moderate (%)	Low (%)
Renewable Energy Investment	33	45	22
Gas-to-Power/Decarbonization Projects	58	31	11
ESG Compliance Reporting	61	29	10
Carbon Capture Implementation	24	37	39



Source: Adapted from NEITI (2023); Okafor, F and Ogujiuba (2021).

The Result indicate that ESG compliance reporting is the issue with the highest commitment, especially for multinational firms that respond to global sustainability pressures. Gas-to-power and decarbonization projects come close, aligning with Nigeria's shift toward gas as a transition fuel. Renewable energy investment remains modest, signaling slow diversification away from crude dependence. The weakest commitment is carbon capture, which remains technically challenging and costly. Overall, most firms remain in transitional phases rather than fully embracing green practices amid their trajectories toward energy transition.

CONCLUSION

This study explores carbon accounting practices and the readiness of Nigerian oil and gas companies toward the global energy transition, adopting a qualitative research design hinged on secondary data sources including annual sustainability reports, ESG disclosures, regulatory documents, and peer-reviewed literature. The results indicate that multinational oil firms are considerably ahead in the adoption of carbon accounting practices compared to indigenous operators, due to their stronger corporate governance, international ESG expectations, and pressures from investors for transparent climate risk reporting. The findings, however, reveal that the adoption remains incomplete within the sector, as many local firms are rather inclined to traditional accounting approaches and without any meaningful, functional carbon reporting frameworks.

The study further identified the most implemented elements of carbon accounting as emission reporting and sustainability auditing, while the procedures of carbon pricing and carbon footprint monitoring are underdeveloped. Some of the challenges facing effective adoption include high costs of technology, poor enforcement of regulatory environment, insufficient skilled personnel, and limited transparency. These bottlenecks underpin the urgent need for capacity building, standardized reporting frameworks, and increased support both at the levels of regulation and technology.

The results indicate that on the readiness to energy transition, there is a fair level of engagement in renewable energy investments and gas-to-power/de-carbonization projects, while ESG compliance reporting is relatively high; however, carbon capture initiatives remain poorly implemented. Generally,

most firms remain in transition phases, which suggests that full-scale adoption of low-carbon practices and robust energy transition preparedness is still developing in the Nigerian oil and gas sector.
The study emphasizes that policy enforcement, capacity-building programs, standardized frameworks, financial incentives, data infrastructure improvement, industry collaboration, and ongoing assessment of progress are key to fostering improved carbon accounting integration and transition readiness. Addressing such challenges will ensure not only stronger climate reporting by Nigerian oil and gas companies but also an effective assumption of low-carbon strategies and meeting global sustainability and energy transition goals.

Recommendations

Following the findings of the study, we therefore recommend that government should;
1. Enforce regulations by increasing regulation compliance in regard to necessary carbon accounting practices adoption by oil and gas companies.
2. Invest in expertise within companies, such as environmental managers or sustainability officers, to address effective greenhouse gas emission reporting.
4. Offer incentives for low-carbon investment. Financial incentives such as tax incentives or green finance may encourage investment in the adoption oftechnologies that reduce GHG emissions.
5. Improve data infrastructure by emphasising the establishment of continuous emission monitoring systems, digital reporting, and linkages with traceable environmental databases.
6. Encourage broad industry collaboration through Joint efforts of global and local operators to facilitate knowledge sharing, capacity enhancement, and adoption of best practices in carbon accounting as well as transition readiness.
8. Support Policy Implementation by Policymakers to ensure that the national climate frameworks, such as the Climate Change Act (2021) and Nigeria's Energy Transition Plan (2022), remain well-supported in terms of policy implementation aligned with corporate reporting requirements.
9. Improve Ongoing assessment of carbon accounting practices and transition readiness is essential.
10. Carry out future studies that involve comparisons of MNEs versus domestic corporations, as well as industry studies focusing on upstream, midstream, and downstream industries, would yield important insights.

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Appendix

Appendix A: List of Oil and Gas Companies Audited by NEITI (2022–2023)

S/N	Company Name	Type	Location
1	Shell Petroleum Development Company	Multinational	Niger Delta
2	Chevron Nigeria Limited	Multinational	Niger Delta
3	TotalEnergies Nigeria	Multinational	Niger Delta
4	Nigerian Agip Oil Company	Multinational	Niger Delta
5	Conoil	Indigenous	Lagos
6	Seplat Petroleum	Indigenous	Delta State
7	Addax Petroleum	Multinational	Niger Delta

Source: Adapted from NEITI (2023).

Appendix B: Regulatory and Policy Documents Consulted

S/N	Document	Year	Purpose in Study
1	Climate Change Act	2021	Regulatory framework for emissions reporting
2	Nigeria Energy Transition Plan	2022	Framework for corporate energy transition readiness
3	NEITI Oil & Gas Sector Audit Report	2023	Primary secondary data on emissions disclosure
4	Greenhouse Gas Protocol	2004	Benchmark for corporate carbon accounting
5	TCFD Recommendations	2017	Standard for climate-risk disclosure

