



Environmental Conservation Costs and Financial Sustainability in Oil and Gas Companies Listed in Nigeria

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Abstract

Due to factors such as low-capacity production, undercapitalization, unlawful stakeholders, and costs, many oil and gas enterprises operating in Nigeria have had difficulty achieving financial sustainability. The financial sustainability of Nigeria's oil and gas companies is significantly influenced by the extent to which corporations engage in environmental conservation and preservation. This research looked at how oil and gas businesses in Nigeria coped with the costs of environmental preservation and how it impacted their bottom line. This research used an ex-post facto methodology due to its reliance on secondary data collected from the publicly available annual financial statements of the selected oil and gas businesses. For the 22 years between 2001 and 2022, 20 out of the population's 66 oil and gas enterprises were selected at random. The data was analyzed using inferential statistics, with the validity and reliability of the data certified by external auditors. The research found that the costs associated with environmental preservation have a significant positive effect on the long-term viability of the working capital turnover of publicly traded oil and gas companies. Specifically, adjusted $R^2 = 0.05$, $W(4, 219) = 22.8071$, $p < 0.05$. The research found that the bottom lines of Nigeria's publicly traded oil and gas companies were negatively impacted by the money they spent on environmental protection. The research concluded that the best way to ensure the long-term financial worth of oil and gas stakeholders was for management to prioritize spending on environmental protection.

Subject Areas

Environmental Accounting

Keywords

Environmental Conservation Cost, Financial Sustainability, Pollution Costs,

1. Introduction

1.1. Background to the Study

In its first definition of financial sustainability, the European Commission defined it as the deployment of financial resources to environmental, social, and corporate governance (ESG) efforts. Green finance, which promotes economic growth while reducing greenhouse gas emissions, pollution, and waste and improving natural resource efficiency, is part of sustainable finance (European Commission, 2015) [1]. Financial sustainability goes beyond the neo-classical reasoning of analyzing sustainability just in terms of economic value to concentrate on the triple bottom line of investment (Bertonello, 2023) [2].

Sustainable financial investments incorporate environmental, social, and governance considerations (Ahmad *et al.* 2023) [3]. Sustainable finance reduces greenhouse gas emissions, pollution, waste, and natural resource utilization while boosting economic development (Sharma *et al.* 2021) [4]. Due to stakeholders' rising understanding of their environmental and social impacts, socially responsible investments are becoming more popular (Bertonello, 2023) [2].

Performance indicators and operational dynamics evaluations alone cannot assure long-term sustainability in the oil and gas business, which has major impacts on society and the environment. Despite their efficiency and public service, this research identifies risk indicators that might disrupt organizations' operations. The conclusions apply to oil and gas corporate management, investors, and domestic and industrial customers who depend on these firms' long-term existence, particularly throughout numerous crises.

Socially responsible investments are becoming more popular. This means prioritizing profit acquisition and its quantitative and intrinsic worth less. Instead, investments are examined for their ability to improve social well-being and the environment. Simply put, increasing profits ignores social and environmental issues, preventing corporations from attaining sustainability. This is because stakeholders are becoming more aware of how these corporations' actions may affect the environment and society. As more investors adopt corporate ethics and environmental and community responsibility in their operations, prioritizing these investments will have a long-term impact. The worldwide oil and gas industry's environmental and social implications are well known. Thus, performance measures and operational dynamics evaluations alone cannot ensure these organizations' long-term viability.

Recently, organizations' strategies and commitment to environmental protection have been examined more closely. Oil and gas industries have been shown to cause pollution, spillage, and gas emissions, which highlights this. These firms' exploration efforts harm their environmental performance (Oraka, 2021)

[5].

Nigerian oil and gas businesses are known for their environmental effects. Their focus on profit maximization and usage of contemporary oil exploration methods are the main causes of this influence. It is disappointing that many petroleum companies still believe that environmental expenses will often result in short-term costs, potentially compromising their long-term effectiveness and efficiency (Nwaiwu & Oluka, 2018) [6], despite the significant quarterly and annual benefits the oil and gas industries can obtain. Disclosed environmental conservation costs boost a company's value and financial success.

Oil and gas firms connect with local communities throughout discovery, production, and marketing. Thus, oil companies must invest more in their communities. Governments, NGOs, and the World Bank have also touted sustainability's role in poverty eradication and community development. Socially sustainable organizations benefit the community.

Social sustainability means protecting people's economic and political rights. These rights may include ethical corporate governance systems, worker rights, community culture, and fair human development. Thus, this may boost stakeholder confidence, helping organizations lower operating costs (Abdulsam, *et al.* 2020) [7].

Financial instability has hindered oil and gas businesses' resource utilization in a competitive market. Oil and gas companies in Nigeria are undercapitalized and lack sufficient financial resources, despite their potential to alleviate poverty by creating wealth for stakeholders and contributing to the country's economic growth by creating jobs. These constraints have slowed industrialization in Africa's greatest economy (Adegbe, *et al.*, 2023) [8].

"Industrial performance greatly affects a nation's finances. It boosts output, creates jobs, and advances the economy. The oil and gas business in Nigeria boosts GDP by producing jobs, wealth, and tax income (Adegbe *et al.*, 2023)." [8]

Oil and gas firms in Nigeria face complicated and diversified financial sustainability issues. These companies have struggled to survive due to limited foreign currency, high borrowing costs, inadequate infrastructure, inconsistent government policies, political and economic uncertainty, and security concerns. Akindehinde *et al.* (2022) [9] say policy inconsistencies and government insincerity have hurt Nigerian corporations. These issues have led oil and gas enterprises to shut down. These firms have also struggled to compete in the highly competitive global market due to market volatility.

The absence of a reliable power supply has caused Nigerian oil and gas firms to produce less installed capacity, worsening their financial viability (Akpan & Uwakmfonabasi, 2021 [10]; Alami, 2020 [11]). Without dependable infrastructure, Nigeria's oil and gas industries face major challenges (Anekwe *et al.* 2019) [12]. Companies have difficulty transporting goods locally and internationally due to power shortages, poor road infrastructure, and restricted port and airport

access.

According to Asuquo *et al.* (2019) [13], volatility, poor foreign exchange policies, interest rate swings, and insufficient government rules and laws hinder the development of several Nigerian sectors. Oil and gas companies have financial sustainability issues due to these issues. Due to poor circumstances, the industry cannot finish most agreements. This hinders industrial efficiency. According to Alami (2020) [11], power fluctuations in Nigeria have raised concerns about business growth and efficiency. Company costs are considerable, increasing manufacturing costs. This presents obstacles for expanding businesses. The industry was also crucial to the nation's oil reduction and diversification efforts. In the literature, increasing a nation's competitiveness, lowering its import dependence, and improving its trade balance are possible advantages.

1.2. Research Objectives

The specific objectives of this study include:

To examine the effect of environmental conservation cost on financial sustainability of the listed oil and gas companies in Nigeria.

To investigate the relationship between environmental conservation costs and the financial sustainability of the listed oil and gas companies in Nigeria.

1.3. Research Hypotheses

The research hypothesis includes:

H_0 : The effect of environmental conservation cost on financial sustainability of the listed oil and gas companies in Nigeria is not significant.

2. Literature Review/Theoretical Review

2.1. Conceptual Review

2.1.1. Sustainability

The concept of sustainability has garnered increased attention from many stakeholders, including managers, investors, global leaders, and a significant portion of the general population. This heightened interest may be attributed to the challenges posed by rising prices as well as the interconnected issues of economic, political, social, and environmental unsustainability (Justice Mensah, 2019) [14]. In a general context, the notion of sustainability pertains to the capacity to maintain or facilitate an ongoing process over an extended period, namely, to possess long-term sustainability (Emeka-Nwokeji and Osisioma, 2020) [15].

Sustainability is a complex concept that seeks to address the fundamental challenge facing mankind, namely the depletion of natural resources. Its primary objective is to integrate the resources of the economy and society in order to provide an environment conducive to sustainable development. The concept of sustainability was officially defined by the Brundtland Commission of the United Nations in 1987. According to their definition, sustainability refers to the endeavour of satisfying the requirements of the current generation while ensuring

that the capacity of generations to come to fulfill their own needs remains intact (WCED, 1987) [16].

As stated by Clarke and Clegg, according to a study conducted in 2000, the concept of sustainability is increasingly recognized as a crucial priority in the business sector. This shift in perspective reflects a departure from the traditional pursuit of dominance over nature and instead emphasises the importance of attaining environmental equilibrium. Sustainability encompasses more than just unrestricted development and the pursuit of economic success; it also involves the integration of social, environmental, and economic factors in the development process. The attainment of favourable economic and financial indicators does not always indicate sustainability but rather signifies profitability or pollution costs only (Justice Mensah, 2019) [14]. In the contemporary landscape, investors are not just focused on a company's profit-generating capacity but also on its capacity to document and evaluate its contributions to society and the environment within its operational sphere (Boffo and Patalano, 2020) [17]. Sustainability is a multidisciplinary concept that effectively integrates several scientific disciplines to pursue a development trajectory centered on the enhancement of economic, social, and environmental welfare (Shi, *et al.* 2019) [18].

Sustainability is a significant concern for oil and gas firms, since they are compelled to adhere to safety, environmental, and health standards in order to ensure the viability of their production processes. A number of factors, such as changes in investment preferences, increased civic engagement from civil society, and the emergence of a new socio-economic backdrop, are driving the need to reduce emissions in the oil and gas sector. The attainment of minimal emissions levels necessitates the use of sustainable technical equipment, a venture that incurs substantial expenses. The acquisition of this equipment therefore engenders a rise in production costs.

According to Branson (2022) [19], the presence of low-carbon energy in the market introduces a range of possibilities and challenges for companies operating within the oil and gas business. To achieve sustainability, it is essential for oil and gas companies to reassess their strategies and goals through the use of proactive sustainability practices. At present, oil and gas continue to be crucial components of the energy portfolio, as seen by the ongoing energy crisis that underscores the economic fragility resulting from reliance on Russia's resources (Grosu *et al.*, 2022a & 2022b) [20] [21]. Simultaneously, this crisis underscores the challenges associated with social, environmental, and pollution costs, prompting a shift in the trajectory of global economies towards the exploration of novel energy alternatives. According to Branson (2022) [19], the oil and gas sector will need to use renewable sources of energy in the future to ensure the preservation of their license to operate. Certain enterprises have already established comprehensive sustainability strategies; nevertheless, their successful execution is impeded by the formidable financial burdens associated with such endeavour.

2.1.2. Employee Health and Safety Cost

Health and safety (H & S) are among the concerns being addressed within the framework of the company's financial sustainable for a healthy employee can work well to help companies make more profit to sustain the company financially (Koinig and Diehl, 2021) [22]. Similar to other management functions, this entails the development and implementation of health and safety initiatives, the measurement and monitoring of performance concerns, and the reporting of these issues to stakeholders within and outside the organization. Disregarding health and safety protocols might result in significant financial costs. The occurrence of occupational accidents incurs financial costs for the firms in which they occur, resulting in a loss of revenue for the affected workers and imposing economic burdens on society, including expenses related to healthcare and diminished work productivity (Tomba, *et al.* 2022) [23].

The incorporation of employee safety and health costs serves as a valuable avenue for workers to acquire supplementary skills and information, as well as to fortify their adherence to high-quality work practices, thereby facilitating a transformation in workplace behaviour (Jonathan and Mbogo, 2016) [24]. The allocation of resources toward the implementation of comprehensive staff training programmes has the potential to provide several benefits, including the enhancement of skills, knowledge, productivity, and morale within the workforce (Zhenjing, *et al.* 2022) [25]. Additionally, such investments may serve to mitigate the occurrence of workplace mishaps by facilitating their prevention and replacement. The role of health and safety is centered on the protection and advancement of the well-being of individuals employed by an organization, including both their bodily and psychological well-being (Ezeokafor & Amahalu, 2019) [26].

2.1.3. Concept of Environmental Conservation Cost

Environmental conservation costs refer to the expenses incurred by a company in order to mitigate the negative effects of its environmental activities (Mukah, 2021) [27]. These costs encompass various aspects, including pollution, waste disposal, drainage, regulatory compliance, and other expenses that aim to prevent or minimize environmental impacts resulting from the company's operations (Abubakar, *et al.* 2022) [28]. The concept of environmental management cost pertains to the strategies and techniques used in effectively managing the expenses related to activities that may result in the need for repair and the potential prevention of environmental damages caused by a company's operations (Stanescu, 2021) [29]. The cost of environmental management facilitates the implementation of environmental protection measures in a cost-effective manner, ensuring adherence to environmental regulations. The process also includes the examination and procurement of cost-effective alternatives to hazardous substances, as well as the submission of reports on environmental waste and emissions to regulatory bodies. Moreover, it facilitates the concurrent decrease in expenses and ecological footprints by enhancing the utilization of water and re-

sources in internal processes (ACCA, 2020) [30].

Oil and gas corporations, particularly multinational oil companies along with other extraction enterprises, are not sufficiently prioritizing the mitigation or prevention of environmental issues that impact oil-producing communities in Nigeria. Therefore, the connections among the people involved are not conducive, as noted by Eze *et al.* (2016) [31]. Furthermore, it has been observed that international corporations operating inside oil-producing towns have not shown complete adherence to environmental rules and regulations. Hence, the efficacy of this legislation remains to be observed. The unsustainable usage of natural resources, heightened contribution to glasshouse gas emissions, and involvement in ozone layer depletion are widespread issues in Nigeria. These factors pose significant obstacles to the creation of a conducive business environment and overall human habitation. Multinational corporations have the potential to make significant contributions to the establishment of a sustainable environment through the implementation of innovative measures aimed at enhancing their goods and processes. This entails the effective utilization of raw materials, the reduction of waste created during production, the enhancement of waste disposal systems, and the improvement of working conditions. It is evident that stakeholders want corporations to engage in the efficient production of commodities at competitive rates while simultaneously ensuring the preservation of the environment. According to Eze *et al.* (2016) [31], this phenomenon has the potential to enhance the overall environmental performance, corporate performance, and happiness of consumers and the community.

2.2. Theoretical Review & Framework

2.2.1. Institutional Theory

The present research examines the theoretical framework of institutional theory, as first posited by John Mayer as well as Brian Rowan in 1970 (Antoun *et al.*, 2018) [32]. The foundation of this research is based on the notion that the economic viability of organizations is significantly influenced by the presence of robust institutions and adherence to established authorities. The focus of the institutional theory is on examining the functional capacity of various components within an institution, enabling the efficient functioning of the organization, and safeguarding both human and contractual rights. Certain traits are often seen in the presumptions that were part of the institutional theory. Elhuni and Ahmad (2017) [33] one of the supporters of the theory posits that institutions are the result of their established governance structure, serving as an accurate representation of established rules, social organization, behavioural norms, and the capacity to enforce their application. The institutional theory posits that organizations and corporate entities that adhere to established regulations are granted legitimacy and acknowledged for their contributions.

The legality of a business organization has considerable importance since the continued operation and success of the organization heavily rely on the acceptance and recognition of its goods and services. Therefore, the preservation of an

organization is of utmost significance in ensuring its ongoing presence. According to Akben-Selcuk (2019) [34], the institutional theory posits that the efficacy of an institution is contingent upon its corporate governance and the individuals responsible for its management. Certain proponents of the institution theory assert that previous research conducted by Arayssi *et al.* (2016) [35] has extensively demonstrated in scholarly literature the importance of robust institutions in attaining organizational objectives. The efficacy of governmental bodies and the caliber of corporate governance are heavily contingent upon the efficacy of institutions in upholding laws, regulations, and norms within both the broader community and the organization itself. Antoun *et al.* (2018) [32] provided empirical evidence for the institutional theory, highlighting the widespread adoption of this theory by several corporations in the United States throughout the period from 1880 to 1935. This adoption of this theory in this study was driven by how the environmental conservation cost enhances an organization financial sustainability and survival (Arayssi *et al.*, 2016) [35]. This will help in actualizing the main purpose of this study of how the environmental costs affect the selected oil and gas in Nigeria's financial sustainability.

2.2.2. Stakeholder Theory

“The concept of stakeholder theory is a framework that examines the relationships and interactions between various individuals or groups, known as stakeholders.” Stakeholder theory posits the notion that there exists a linked interaction among management, shareholders, and other stakeholders that collectively contributes to the creation and sustenance of corporate value. The responsibility for ensuring adequate performance as well as company value rested with the management. The driving force behind firm value is consistent profitability, which serves as an indicator of the organization's robust strategic orientation and performance culture. These factors are reinforced by a competent management team and contribute to the advancement of the company's overall prosperity. Furthermore, when it comes to supporting financial sustainability, stakeholders' theory has been taken into account due to the direct relationship and correlation between the reliability of financial reporting theory and signaling theory in the context of sustainability reporting. The integrity of financial sustainability plays a crucial role in enhancing the quality and long-term positive reputation of oil and gas companies that are renowned for their strong and dependable financial reporting are granted favourable recognition due to the potential of their published financial statements to provide economic value to those making decisions. Banks are more likely to garner acceptability and legitimacy from stakeholders, including the general population, when they possess knowledge that the financial statements presented by the banks exhibit a high level of quality.

Freeman created stakeholder theory in 1983, and the primary emphasis of stakeholder theory in the field of environmental accounting pertains to the examination and resolution of environmental disclosure elements, valuation, and

incorporation for individuals or entities external to the organization that use the financial statements. The idea posits that the primary goal of the firm is to satisfy the demands of its shareholders through the generation of financial gains. Failure to prioritize the environmental conditions in which a firm works may result in its inability to generate profit. The idea posits that the stakeholders of a business include a wide range of individuals who are affected by the company's operational activities. Based on the aforementioned theory, it is proposed that businesses should take into account the interests of all stakeholders involved in their operations, beyond just their shareholders. These stakeholders encompass the community at large, government entities, environmental organizations, suppliers, and customers, as well as other individuals or groups whose support is vital for the organization's functioning (Omaliko, Nweze, & Nwadiolor, 2020) [36].

2.3. Empirical Review

Oguae and Ekpulu (2020) [37] examined how many listed industrial companies in Nigeria declare their organizational performance using environmental disclosure methodologies. Ex post facto research was performed to gather data from firm financial filings. The researchers employed pooled regression analysis to investigate panel data and found that environmental disclosure practices improved companies' reputations and stakeholders' product views. The study also indicated that firm size and environmental disclosure reporting favorably impacted the performance of selected Nigerian industrial enterprises.

Emeka-Nwokeji and Benjamin (2020) [15] looked at how sustainability disclosure affects the economic and social governance (ESG) parts of market value and corporate growth in a few emerging nations, including Nigeria. Ex post facto research was used to analyse the data. This analysis employed publicly accessible, audited financial statements. The regression study showed a favourable association between environmental sustainability disclosure and business market value.

Emeka-Nwokeji and Benjamin (2020) [15] found similar results to Eze *et al.* (2016) [31]. The regression study showed that environmental and sustainability reporting improved corporate financial performance. In contrast, Ezeagba *et al.* (2017) [38] and Emeka-Nwokeji and Benjamin (2020) [15] found conflicting results. The study showed that environmental accounting hurts company performance.

Etim *et al.* (2020) [39] looked at how environmental disclosure and performance parameters affected the price ratio of earnings and the overall financial health of a group of Nigerian companies that were on the stock market. The study sampled 10 general-population businesses. The investigation comprised ten-year financial statements from chosen firms. The study found a favourable association between environmental disclosure and firm performance using panel data. Hassan and Lahyani's results match Etim *et al.*'s (2020) [39]. Environmen-

tal disclosure improved the chosen firms' price-earnings ratios.

Kim and Oh (2019) [40] examined the chosen companies' CSR initiatives' effectiveness. They examined how environmental conservation expenses affect business asset quality. The research examined secondary data from Indian companies' financials. The study used ex-post facto methods. The F-statistics of joint variables suggest that sustainability improves the corporate organizational performance of selected Indian firms. No significant discrepancies were found between Kim and Oh's (2019) [40] results and Kaur and Lodhia's (2019) [41]. The study found that environmental conservation costs and stakeholder involvement affected the financial health of selected Australian enterprises. Amin *et al.* (2019) [42] found that environmental conservation spending did nothing in the way of improving Islamic banks' assets and financial sustainability in the area. Kim and Oh's research disagrees.

Tanzania, Lotto (2019) [43] examined how environmental preservation affects operational efficiency, asset quality, and company success. An experimental investigation was conducted utilizing secondary data from chosen firms' financial records. The study used descriptive statistics and multiple regression. The analysis showed a negative correlation between company performance and sustainability. The study also found that environmental preservation expenses hurt Tanzanian enterprises' financial performance. Lotto (2019) [43] matches Akben-Selcut (2019) [34]. Results showed that corporate sustainability has little impact on Turkish bank performance. In contrast, Lotto's 2019 study [43] and Ezeokafor and Amahalu's 2019 study [26] cannot be directly compared. At 0.05 significance level, the study found that environmental cost indexes improve company performance.

Anekwe *et al.* (2019) [12] examined the financial consequences, efficacy, and integrity of Nigerian banking sector environmental conservation measures. This study used ex-post facto secondary data. The data came from 10-year Nigerian bank financial statements. According to panel data analysis, conservation-related charges improved bank performance. Both Anekwe *et al.* (2019) [12] and Ezeokafor and Amahalu (2019) [26] research reached the same outcomes. A 0.05 percent significance criterion showed that environmental cost indices improved company performance. However, Anekwe *et al.* (2019) [12] cannot be compared.

Nwaubani (2019) [44] examined how internal factors affect Nigerian oil and gas companies' financial performance. The study examined how environmental conservation expenses affect return on assets, a profitability indicator. The research also included staff productivity, capital sufficiency, asset quality, and board size as social responsibility criteria. Secondary data were acquired from the accounting records of the selected deposit money banks (DMBs) from 2004 to 2016. The panel data regression analysis yielded unsatisfactory findings. Board size and staff terminal benefits have no effect on return on assets, according to the research. Capital sufficiency and staff productivity were beneficial. According to the research, oil and gas businesses undertaking reorganization

should be cautious in their corporate governance monitoring function. This is vital to avoid undesirable effects like worker morale and productivity drops. Okolie and Igaga (2020) [45] found that environmental conservation expenditures boost the finances of Nigerian industrial businesses. The above results make Nwaubani's 2019 study [44] comparable. However, Nobanee and Ellili (2017) [46] and Nwaubani (2019) [44] results cannot be directly compared. The study concluded that sustainability reporting's social, environmental, and economic dimensions hurt UAE enterprises' financial performance.

Oti and Mbu-Ogar (2018) [47] examined how social and environmental reporting affect Nigeria's publicly listed oil and gas companies' financial performance. The research collected and analyzed data over five years using ordinary least-squares regression. Integration of stakeholder and legitimacy theories underpinned this investigation. These ideas explain organizations' role in society's demand for accountability and financial success. The statistical research showed that disclosing the health and safety of employees and community development did not affect the business's financial success. However, waste relationship management improved the firm's financial performance. The report proposes that oil and gas companies routinely evaluate their waste management strategies and employ innovative technology to reduce their environmental impact. To increase firm value, oil and gas companies must improve worker health and safety in line with their objectives and vision statements. To avoid stakeholder resentment, firms must prioritize community development. Failure to do so may harm their operations and performance.

All of these studies examine how financial performance or returns on assets impact the cost of being environmentally conscious or the quantity of environmental information Nigerian banks and oil and gas firms provide. They generally used conventional least squares or pooled regression and found a positive and significant relationship between their independents and their variables. However, this study found several holes that the researcher will fill. Most of these studies utilized five years, but this one will use 22. The study picked 20 Nigerian exchange-listed oil and gas firms to make this job more dependable. Finally, to analyse the impact of environmental conservation costs on the monetary viability of the selected oil and gas, the researcher has decided to use environmental issues and safety promotion expenses (ESPC), costs associated with research and development for environmentally friendly products and services (RDEC), pollution costs (PC), and community development costs (CDC). The study also met a demand for financial sustainability measurement using the working capital turnover ratio.

3. Methodology

3.1. Method

Stahl and King's (2020) [48] approaches to data collection and analysis were followed since they were shown to be effective in the current literature. In the first

step, the researcher collects and compile a representative sample covering a 22-year time period (2001-2022). This sample includes financial and economic information from 20 oil and gas production businesses.

The research strategy for this study includes explanation, history, and correlation. Providing a thorough explanation of the characteristics of a social or demographic phenomenon is the overarching goal of explanatory research (Saunders *et al.*, 2007) [49]. When doing research within a quantitative framework, this method is often helpful since it facilitates the identification of causal connections or impacts. The study's overarching goal is to learn how much of impact environmental conservation expenses have on the financial sustainability of Nigeria's publicly traded oil and gas firms. In addition, regression analysis, a statistical method used to measure the relationship between two variables, is integral to the correlational approach used. It's useful to look for evidence that one variable affects another.

Twenty (20) oil and gas companies trading on the Nigerian Stock Exchange in December 2022 made up the study's population. The NGX Group (Nigerian Exchange Group) provided the data utilized in this analysis. From 2001 until 2022, researchers analyzed the data.

Purposive sampling was used to pick 20 publicly traded companies for this study. A set of indicators and financial ratios thought relevant in forecasting the economic and financial sustainability of these businesses were then calculated using the data acquired from the financial statements. These factors allowed for the creation of an econometric model that can be used to evaluate the economic sustainability of businesses in the oil and gas and oil extraction sectors according to their respective segments of operation, risks, and performance.

A regression model guided the analysis of the information gathered. The purpose of this research was to look for correlations or causal relationships between the variables of interest. This made it easier to test the hypotheses.

In this research, quantitative analysis was chosen as the technique of choice for data analysis. Multiple regression analysis using pooled regression analysis was the kind of inferential analysis studied.

3.2. Operationalization of Variables and Model Specification

Dependent Variable: The rate of return on one's working capital is an indicator of financial health. Financial sustainability has been evaluated using a number of different matrices in previous studies. In this study, the author applies the working capital turnover ratio (WCTR) to the idea of financial sustainability, in line with past academic studies. The working capital turnover ratio is determined by dividing the net sales for an accounting period by the working capital for that same period. It is critical for investors to evaluate a company's ability to meet its financial obligations and enhance its long-term financial sustainability. Companies with high turnover or that pay out dividends often benefit greatly from monitoring this ratio. To determine a company's working turn-

over ratio, the working capital ratio is represented as follows:

$$\text{Working capital Turnover ratio} = \frac{\text{Net Sales}}{\text{Working Capital}}$$

Where: Net Sales = Total Sales – Sales Return

Independent Variable: The variable of interest, the price tag associated with protecting the environment, was quantified using data from four different checklist items. The expenses of pollution, community development, environmental product and service R&D, and the promotion of environmental and occupational health and safety are all included in these indices. The Global Reporting Initiatives (20) cost measures for environmental conservation were used to figure out these indicators. The measures came from the annual financial statements of the oil and gas companies that were used in the study.

$$Y_{it} = \beta_0 + \beta_i X_{it} \quad (3.1)$$

Functional Relationship

$$\text{WCTR} = f(\text{ESPC}, \text{RDEC}, \text{PC}, \text{CDC}) \quad (3.2)$$

Algebraic Relationship

$$\text{WCTR}_{it} = \beta_0 + \beta_1 \text{ESPC}_{it} + \beta_2 \text{RDEC}_{it} + \beta_3 \text{PC}_{it} + \beta_4 \text{CDC}_{it} + \varepsilon_{it} \quad (3.3)$$

where: “ESPC = environmental and safety promotion costs, RDEC = research and development costs for environmentally friendly products and services,” PC = pollution costs and CDC = community development costs.

4. Results, Analysis and Discussion of Findings

The data used for the analysis is obtained from the Nigerian Exchange Group (NGX Group) and Global Reporting Initiatives. The data relate to the working capital turnover ratio, environmental and safety promotion costs, research and development costs for environmentally friendly products and services, pollution costs, and community development costs. In the next parts of this chapter, different tables show the descriptive statistics, correlation matrix, diagnostic test of variance inflation factor (VIF), heteroskedasticity test, Hausman test, and random effect test.

4.1. Descriptive Statistics

Table 1 shows investigative descriptive data. The results show that WCTR ranged from 0.183062 to 58.77953. This suggests that Nigerian oil and gas companies have a low but positive working capital turnover ratio. This implies that the present value surpasses the asset replacement cost. The mean working capital turnover ratio is 18.74132, with a standard deviation of 11.56364. This shows 52% ratio disclosure variability. The computed kurtosis is 78.82145.

The range of environmental and safety promotion costs is 1.148356 to 0.00088, with a mean of 0.320943. The mean disclosure rate for environmental and safety promotion is 115%, the highest documented percentage. Kurtosis is

Table 1. Descriptive statistics.

Variables	Mean	Std. Dev.	Kurtosis	Maximum	Minimum
WCTR	18.74132	11.56364	78.82145	58.77953	0.18306
ESPC	0.32094	0.29259	75.22535	1.14836	0.00088
RDEC	4.34661	1.55548	34.99410	6.62004	1.73732
PC	3.73821	1.45793	66.06565	8.23702	0.82500
CDC	15.95000	20.65800	93.17000	22.14800	3.16800

EViews Output, 2023.

75.22535. The standard deviation is 0.29259, showing 29% variability. This finding suggests that Nigerian oil and gas businesses lack environmental disclosure, since it closely matches the mean value.

Table 1 shows that oil and gas companies in the sample spend 4.346615 on environmentally friendly product and service research. These organizations report social sustainability to this degree. Its highest and lowest disclosure values are 6.620042 and 1.737318, respectively. The kurtosis is 6.62004, showing positive skewness. The standard deviation of 1.55548 indicated significant social sustainability disclosure variability compared to the mean value. This shows high disclosure.

The table in this analysis shows that the chosen oil and gas businesses' environmental costs average 3.73821 with a standard deviation of 1.45793. This shows 146% heterogeneity in pollution cost disclosure. This suggests that these corporations disclose environmental costs extensively. Pollution costs range from 0.82500 to 8.23702. Kurtosis is 66.06565.

The mean and standard deviation of community development costs were 1.59500 and 2.06580. This implies that the firm's capital structure averaged 160% debt. Sales growth averages 42%, with figures ranging from 44% to 88%.

4.2. Inferential Statistics

Regression Results: The regression analysis of environmental conservation costs and financial sustainability of the 20 listed oil and gas in Nigeria from 2001 to 2022 is presented in **Table 2** below.

$$WCTR_{it} = \beta_0 + \beta_1 ESPC_{it} + \beta_2 RDEC_{it} + \beta_3 PC_{it} + \beta_4 CDC_{it} + \varepsilon_{it} \quad (4.1)$$

$$WCTR_{it} = -1160.77 + 0.005893ESPC_{it} + 133.6736RDEC_{it} - 41.7666PC_{it} + 4.847858CDC_{it} + \varepsilon_{it}$$

$$Z\text{-test} = -0.8839 \quad 0.9625 \quad 2.3375 \quad -1.9839 \quad 0.392857$$

4.3. Test of Hypotheses

4.3.1. Interpretation of Post Estimation

The model's parameter was estimated for how environmental protection costs affect the financial sustainability of Nigerian oil and gas companies using the System General Method of Moment post-estimation testing. The four best tests are: The first examines the serial correlation of the first autoregressive order

Table 2. Environmental conservation cost and financial sustainability (working capital turnover ratio).

Variables	Panel-data estimation, two-step system GMM	
ESPC	Coefficient	0.005893
	Standard error	0.011786
	T-Stat (Prob)	0.9625 (0.5947)
RDEC	Coefficient	133.6736
	Standard error	112.0213
	T-Stat (Prob)	2.3375 (0.2214)
PC	Coefficient	-41.7666
	Standard error	41.51715
	T-Stat (Prob)	-1.9839 (0.2983)
CDC	Coefficient	4.847858
	Standard error	24.71268
	T-Stat (Prob)	0.3929 (0.8018)
CONSTANT	Coefficient	-1160.77
	Standard error	2579.832
	T-Stat (Prob)	-0.8839 (0.6204)
Observations	440	440
Wald test	chi ² (4) = 22.8071 (0.000)	
Adjusted R ²	0.05	
AR(1)	Z = -1.00 (0.316)	
AR(2)	Z = 0.98 (0.328)	
Test of overbid. Restrictions	Sargan: chi ² (495) = 562.1394 (0.068)	
	Hansen: chi ² (495) = 53.4482 (1.000)	
Exogeneity tests: GMM instruments for levels	Hansen: chi ² (414) = 51.3072 (1.000)	
	Difference (null H = exogenous): chi ² (81) = 2.14 (1.000)	
Exogeneity tests: Individual Instruments	Hansen test excluding group: chi ² (489) = 43.19 (1.000)	
	Difference (null H = exogenous): chi ² (3) = 10.25 (0.156)	

EViews Output, 2023. Note: Working capital turnover ratio (WCTR), Environmental and safety promotion costs (ESPC), Research and development costs for environmentally friendly products and services (RDEC), Pollution costs (PC) and Community development costs (CDC).

under the null hypothesis of no serial correlation. The second serial correlation test uses an autoregressive model of order two, with the null hypothesis assuming no serial correlation. Thirdly, the model's null hypothesis is suitable for the Hansen test to detect over-identifying limitations. The Sargan test evaluates the variables' appropriateness and the model's values in the final step.

The null hypothesis of no serial correlation was not rejected. The alternative hypothesis of serial correlation was rejected. Based on the autoregressive order 1 model's statistic of -1.00 and probability value of 31.6 percent, this conclusion is drawn. SGMM predicts that consecutive error terms will correlate and that AR (1) will have a big influence. The alternative hypothesis of no serial correlation

replaced the null hypothesis. This conclusion was based on the AR (2) statistic of 0.98, which generated a 32.8% probability and was statistically insignificant. Scholars agree that the autoregressive model of order 2 (AR (2)) should be serially independent. Thus, the calculated model is flawed.

The Sargan and Hansen tests evaluate model validity using probability values of 1.000 and 0.000. The Sargan test yielded 562.1394 and a 6.8% probability. This shows no statistical significance. Hansen statistics, with a value of 53.4482 and a probability of 100%, are above 0.05, indicating that the model is valid. According to the Hansen Test, all instruments are legal since the null hypothesis states that over-identifying limits are acceptable. Hansen's findings supported the validity and usefulness of each estimating model instrument.

The Difference-in-Hansen tests, which assess GMM instrument subset independence at levels, provide 2.14. The probability is 100%, suggesting statistical insignificance. This shows the model is dynamically complete and the estimating tools are valid. The difference-in-Hansen test statistic, which examines instrument subset exogeneity for individual instruments, is 10.25. The test is statistically insignificant, with a probability of 15.6%. Thus, the Hansen test supported the null hypothesis of excluding these instruments. This means there is no evidence to warrant adding instruments to the model. This discovery also confirms the model's sensors' completeness.

4.3.2. Results, Analysis, and Explanation

Table 2 shows that the work-capital turnover ratio and environmental and safety promotion expenses are positively correlated. This implies that environmental and safety promotion costs would increase the working capital turnover ratio. A one percent increase in environmental and safety promotion expenditures should raise the working capital turnover ratio by 0.005893 percent. The analysis finds no correlation between Nigerian oil and gas firms' WCTR and environmental and human safety expenses (ESPC = 0.005893, Z-test = 0.9625, $p > 0.05$). This implies that environmental and safety promotion costs have little effect on Nigerian oil and gas companies' working capital turnover ratio (WCTR).

The research found a favourable association between environmental conservation cost indicators and the working capital turnover ratio. As environmental conservation cost indicators rise, so does the working capital turnover ratio. Oil and gas companies' working capital turnover ratio (WCTR) will rise by 133.6736 for every 1% increase in environmental and safety promotion expenditures. The study discovered no significant correlation between Nigerian oil and gas businesses' working capital turnover ratio (WCTR) and eco-friendly research and development products and services pricing (RDEC = 133.6736, Z-test = 2.3375, $p > 0.05$). This implies that Nigerian oil and gas businesses' working capital turnover ratio (WCTR) is unlikely to be affected by social and environmental expenses.

The research also found a negative association between pollution cost indicators and the working capital turnover ratio. In particular, a 1 percent increase in

pollution expenses decreases the working capital turnover ratio by 41.7666 percent. An increase in pollution cost indicators would lower the working capital turnover ratio. Pollution costs do not significantly affect the working capital turnover ratio (WCTR) of Nigerian oil and gas companies ($PC = -41.7666$, $Z\text{-test} = -1.9839$, $p > 0.05$). This implies that environmental protection costs do not significantly affect the working capital turnover ratio (WCTR) of Nigerian oil and gas companies.

This research found that Nigerian oil and gas firms' working capital turnover ratio (WCTR) is positively correlated with community development expenses. When research and development expenses for environmentally friendly goods and services rise by 1%, the working capital turnover ratio (WCTR) rises by 4.847858 percent (CDC). Growing community development cost indicators (CDC) will increase the working capital turnover ratio (WCTR). The working capital turnover ratio (WCTR) of Nigerian oil and gas corporations is not strongly correlated with community development expenses for environmentally friendly products and services. The computed coefficient's statistical significance determines this. The coefficient estimates of 4.847858, Z-test of 0.392857, and p-value > 0.05 corroborate this. This measure of research and development expenses for environmentally friendly products and services has little impact on Nigerian oil and gas businesses' working capital turnover ratio (WCTR).

Working capital turnover ratio (WCTR) variations may be attributed to environmental and safety promotion costs (ESPC) and researching and developing eco-friendly products and services (RDEC). The adjusted R^2 shows this. This research examines how a 5% change in the working capital turnover ratio (WCTR) affects the Nigerian oil and gas industries. The remaining 95% of WCTR variations are due to non-model causes.

5. Conclusion and Recommendations

This study examined how environmental conservation costs affect Nigeria's publicly listed oil and gas companies' financial sustainability. Environmental conservation may affect Nigerian oil and gas businesses' financial sustainability due to its importance. The research evaluates financial sustainability in the oil and gas sector using the working capital turnover ratio. It examines undercapitalization and the importance of cash flow for Nigerian oil and gas businesses' sustainable expansion. Environmental conservation costs were measured using environmental and safety promotion costs and research and development expenditures for eco-friendly goods and services.

A regression estimates of the parameter produced mixed results. The working capital turnover ratio was positively but statistically insignificantly affected by environmental and safety promotion costs, research and development costs for environmentally friendly products and services, and these variables. However, environmental and safety promotion costs negatively and statistically insignificantly affected the working capital turnover ratio. The working capital turnover

ratio improved significantly after including the environmental conservation cost in the combined statistics with all other explanatory factors. The study found that environmental conservation expenditures affect Nigerian industrial businesses' financial viability.

The following are suggestions:

1) Based on the discovered results, the study recommends that oil and gas company executives evaluate their environmental policies with the aim of strengthening them and reaffirming their dedication to safeguarding the environment.

2) In order to effectively assess the degree of adherence to environmental protection and conservation measures in Nigeria, it is essential for policymakers to diligently fulfil their oversight obligations.

3) To guarantee appropriate consequences for oil and gas companies found responsible for negligence, it is essential for host communities to adopt a proactive approach by promptly reporting instances of water and farmland pollution to the appropriate authorities.

6. Contribution to Future Research

This research is an important addition to what's already been written because it looks at how and why oil and gas companies are financially sustained through their expenses on the environment conservation. The findings of this study will be of particular interest and utility to the management, managers, and directors of these companies, as they will enhance their understanding of the importance of adopting the right attitude towards environmental conservation costs. This can serve as a bed rock for other related study and considering the variables that were used in capturing environmental conservation costs and other researchers can use the findings of this study as a literature to support their arguments on the subject matter.

Conflicts of Interest

The authors declare no conflicts of interest.

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