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Environmental Cost and Economic Performance of Listed Multinational Corporations in Nigeria

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Abstract: Economic performance is a crucial measure of corporate success, but businesses globally encounter difficulties in accurately implementing it, which can result in misreporting financial stability and obstruct sustainable development. Consequently, this study seeks to examine the impact of environmental costs on the economic performance of listed multinational corporations in Nigeria. This study employed an ex-post facto research design; population of the study comprised 55 multinational corporations listed on the Nigerian Exchange Group (NGX) as of 31st December 2023 and 44 firms that fully complied with sustainability reporting were selected using purposive sampling technique. The study spanned a twelve-year period from 2012 to 2023, and data were obtained from annual reports of the investigated firms. Both descriptive and inferential statistics were used for data analysis. The empirical findings revealed that pollution control costs had negative and significant impact on economic performance. Waste management costs were found to have a negative but insignificant effect, while environmental remediation costs had positive yet insignificant effect on economic performance. The study concluded that spending on pollution control does not add economic value and negatively affects the firms' economic performance. It is recommended that multinational corporations restructure their economic activities to reduce spending on pollution control, thereby mitigating its adverse impact on their economic performance.

Keywords: *Environmental cost; pollution control cost; waste management cost; environmental remediation cost; economic performance*. ***JEL CODES: L25; Q56***

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Introduction

Economic performance is a valuable metric for evaluating corporate performance, but companies worldwide face challenges in its effective implementation, leading to potential misrepresentations of financial health and hindering sustainable growth (Agyemang et al., 2024). There is often a gap between economic value added (EVA) and market perceptions (Dagunduro et al., 2024). For example, Amazon and Tesla have reported negative or low EVA due to high reinvestment costs, despite high market valuations (Forbes, 2020). Companies in developed nations tend to prioritize short-term financial metrics over long-term EVA, contributing to financial crises, as seen with several US and European banks (IMF, 2019). General Electric reported a negative EVA of -$6.2 billion in 2017, highlighting operational and capital allocation issues (Fortune, 2018). Boeing's EVA dropped by $4 billion in 2019 due to the 737 MAX crisis (Wall Street Journal, 2020). Despite high market valuation, Amazon's EVA remained low or negative for years due to significant reinvestments (Forbes, 2020).

In developing nations, economic performance challenges are heightened by weaker financial infrastructure, less stringent regulatory environments, and economic instability. Many companies in countries like Nigeria and India, struggle to implement sophisticated financial metrics, leading to inaccuracies and mismanagement. Over 70% of SMEs in Nigeria reportedly lack the capability to measure EVA accurately, resulting in inefficiencies (World Bank, 2020). Unstable economic conditions and fluctuating regulatory frameworks in places like Venezuela and Zimbabwe make maintaining consistent economic performance difficult, leading to high capital costs and unpredictable financial outcomes (IMF, 2021). Access to affordable capital is also a significant issue, with high-interest rates and limited credit availability in many African countries lowering economic performance for potentially profitable companies (African Development Bank, 2019). The economic crisis in Venezuela has resulted in negative EVA for most domestic companies, with capital costs exceeding operating profits by over 50% (Dagunduro et al., 2025; IMF, 2021).

As global concerns regarding environmental sustainability escalate, comprehending the relationship between environmental costs and economic performance becomes increasingly vital for businesses, particularly multinational corporations (MNCs) in emerging economies like Nigeria (Awotomilusi et al., 2025; UNCTAD, 2021). The intersection of environmental sustainability and economic viability is a significant focus for MNCs across both developed and developing nations. With the world facing urgent environmental challenges such as climate change and pollution, businesses are under mounting pressure to reduce their environmental impact while preserving their competitive edge and

shareholder value (Abe et al., 2025; Fatah & Hamad, 2022). This challenge is particularly pronounced in emerging economies like Nigeria, where rapid industrialization and natural resource exploitation pose substantial environmental and socio-economic risks (Khan et al., 2020).

The environmental costs borne by MNCs in Nigeria encompass a broad spectrum of activities, including pollution control, waste management, and regulatory compliance, which not only impact their profitability and cash flow but also pose reputational and operational risks (Dasgupta et al., 2019). Given their extensive influence in various sectors like oil and gas, manufacturing, and finance, listed MNCs in Nigeria play a significant role in shaping both environmental outcomes and economic performance in the country (Ogiriki & Clark, 2024). Environmental sustainability creates value and drive innovation, thereby enhancing long-term economic performance and competitive advantage for MNCs (Awotomilusi et al., 2023). By adopting sustainable practices, companies can reduce costs, increase operational efficiency, attract investment, and enhance brand reputation, ultimately contributing to their financial resilience and market competitiveness (Rejeki & Nurlatifah, 2024).

The existing empirical research has extensively investigated the nexus between environmental costs and economic performance across various economies, including Nigeria. Scholars have explored how environmental expenditures, encompassing pollution control, compliance costs, and environmental damage, impact economic indicators and outcomes. Smith and Johnson (2023) conducted a comparative analysis across developed and developing economies, revealing nuanced effects of environmental costs on firm performance and economic growth. Adekunle and Yusuf (2022) focused on Nigeria specifically, highlighting the substantial economic costs of environmental degradation on productivity, public health, and social welfare. Meanwhile, Ibrahim and Okonkwo (2021) delved into the manufacturing sector in Nigeria, elucidating the trade-offs between environmental expenditures and firm competitiveness. MNCs in Nigeria bear environmental costs encompassing pollution control, waste management, and environmental remediation costs, impacting their profitability, cash flow, and operational resilience. Despite existing empirical research has explored this relationship across various economies, including Nigeria, there remains a gap in comprehensive studies specifically examining the effect of environmental costs on the economic performance of listed MNCs. Therefore, this study aims to fill this gap by investigating how environmental costs affect the economic performance of listed MNCs in Nigeria.

Understanding how companies handle environmental expenses, mitigate related risks, and capitalize on opportunities to improve economic performance is vital for several reasons. It facilitates the creation of effective corporate strategies tailored to Nigeria's distinctive business landscape. By grasping how businesses address environmental costs like pollution control expenditures and waste management expenses, organizations can pinpoint areas for enhancement and enact strategies to streamline resource allocation and operational effectiveness. This comprehension also plays a crucial role in shaping regulatory frameworks geared towards fostering sustainable development in Nigeria. By scrutinizing how companies react to environmental regulations, policymakers can devise policies that strike a balance between safeguarding the environment and fostering economic growth. This involves incentivizing environmentally responsible practices, imposing penalties for non-compliance, and encouraging innovation in eco-friendly technologies.

Literature Review

This section points out the empirical evidence and theoretical foundation for this study.

Conceptual Review

This section clarifies the concepts and variables used in this study by providing detailed definitions and explanations. This clarity helps to establish a solid foundation for the research, ensuring that readers and researchers alike can comprehend and replicate the study accurately.

Economic Performance

Economic performance refers to the overall health and productivity of an economy, encompassing various indicators that measure its ability to generate wealth, produce goods and services, and distribute resources efficiently (Kim & Lee, 2020). It is regarded as a critical yardstick for evaluating the effectiveness of economic policies, assessing the competitiveness of businesses, and gauging the well-being of individuals within a society (Odugbemi & Igbekoyi, 2022). Key components of economic performance include factors such as gross domestic product (GDP), employment levels, inflation rates, income distribution, and international trade balances (Smith & Johnson, 2023). These indicators provide insights into the level of economic activity, the stability of prices, the extent of income inequality, and the degree of integration with global markets, collectively shaping the overall economic landscape of a nation (Ajah & Adegbie, 2023; Dagunduro et al., 2024).

Furthermore, economic performance serves as a crucial determinant of a country's standard of living and its ability to achieve sustainable development goals (Akinleye & Adeoye, 2021). High levels of economic performance are associated with increased opportunities for employment, higher incomes, improved living standards, and enhanced access to goods and services (Bessong et al., 2023). Conversely, poor economic performance can lead to economic instability, unemployment, poverty, and social unrest (Chen & Wang., 2021). Therefore, policymakers, businesses, and individuals closely monitor economic performance indicators to make informed decisions regarding investment, consumption, savings, and policy formulation, aiming to achieve optimal economic outcomes and foster long-term prosperity (Kim & Lee, 2020).

In the context of this study, economic performance refers to the effectiveness and efficiency with which a company utilizes its resources to generate profits, growth, and value for its stakeholders. It reflects the company's ability to achieve its strategic objectives and compete effectively in the marketplace. Key components of economic performance at the firm level include measures such as profitability, productivity, market share, economic value added (EVA), return on investment (ROI), and shareholder value. These indicators provide insights into the company's financial health, operational efficiency, competitive positioning, and overall success in delivering value to its shareholders and other stakeholders. This study measured economic performance using EVA.

Environmental Cost

Aremu and Adegbie (2024) described environmental costs as the expenditures specifically associated with mitigating the impacts of a company's environmental practices, including expenses related to pollution control, waste management, drainage systems, regulatory compliance, and other costs aimed at potentially preventing adverse environmental effects resulting from the company's operations. Environmental cost refers to the expenses incurred by individuals, organizations, or society due to the negative impacts of human activities on the environment (Mensah & Asante, 2022). These costs arise from various activities that result in environmental degradation, pollution, resource depletion, and ecosystem damage. Environmental costs can be categorized into direct costs, which are incurred directly because of environmental damage or pollution, and indirect costs, which arise from the secondary effects of environmental degradation, such as health impacts, loss of biodiversity, and decline in ecosystem services (Akinleye, 2022). Examples of environmental costs include expenses related to pollution control measures, environmental remediation efforts, waste management, clean-up activities, and regulatory compliance.

Moreover, environmental costs encompass both tangible and intangible impacts on society, the economy, and the natural environment. Tangible costs include expenditures on pollution control technologies, fines and penalties for environmental violations, healthcare costs associated with pollution-related illnesses, and loss of income due to environmental damage to natural resources (Onyekachi et al., 2020). Intangible costs, on the other hand, include the loss of biodiversity, degradation of ecosystem services, diminished quality of life, and social disruptions caused by environmental degradation (Ibrahim & Okonkwo, 2021). Environmental costs reflect the full economic and societal burden of unsustainable practices and serve as a measure of the true cost of human activities on the environment. In the context of this study, environmental cost includes waste management cost, environmental remediation cost, and pollution control cost (Lawal et al., 2024).

Waste Management Cost

Waste management cost refers to the expenses incurred in the collection, transportation, treatment, and disposal of waste materials generated by human activities (Ezonfade et al., 2024). It encompasses the financial resources allocated to various processes involved in managing waste, including sorting, recycling, composting, incineration, and landfilling. Waste management costs are incurred by individuals, businesses, governments, and other entities responsible for handling and disposing of waste in an environmentally responsible manner (Ndlovu & Moyo, 2021). These costs include direct expenses, such as investments in waste collection infrastructure, operational costs of waste treatment facilities, and fees for waste disposal services, as well as indirect costs, such as, healthcare costs associated with waste-related illnesses, and the economic impacts of pollution and environmental degradation (Adekunle & Yusuf, 2022). Waste management costs vary depending on factors such as the type and quantity of waste generated, the methods used for waste treatment and disposal, and regulatory requirements governing waste management practices (Okoro & Okafor, 2023). Efficient waste management practices can help minimize costs, reduce environmental impacts, and promote resource conservation and sustainability (Kolawole et al., 2023).

Environmental Remediation Cost

Environmental remediation cost refers to the expenses incurred in restoring or mitigating environmental damage caused by pollution, contamination, or other harmful activities (Chen & Wang, 2021). It encompasses the financial resources allocated to activities aimed at cleaning up and restoring polluted or contaminated sites to their original or acceptable environmental condition. Environmental remediation costs typically include expenses associated with site assessment, remedial investigation, cleanup activities, and monitoring and maintenance of remediated sites (Garcia & Martinez, 2022).

These costs can vary significantly depending on factors such as the extent and severity of contamination, the type of pollutants involved, the size and location of the affected area, and the remediation technologies and methods employed (Kim & Lee, 2020). Environmental remediation costs may also include legal and regulatory expenses associated with compliance with environmental laws and regulations governing cleanup activities (Smith & Johnson, 2023). Effective environmental remediation efforts are essential for mitigating environmental risks, protecting human health and ecosystems, and restoring contaminated land and water resources to a safe and sustainable condition (Gerged et al., 2024).

Pollution Control Cost

Pollution control cost refers to the expenditures incurred by companies or organizations to prevent, reduce, or mitigate pollution and its adverse environmental impacts (Ogiriki & Clark, 2024). These costs include investments in technologies, equipment, infrastructure, and processes aimed at controlling the emission of pollutants into the air, water, or soil during production or operational activities. Pollution control costs also encompass expenses related to monitoring, testing, and maintaining pollution control systems to ensure compliance with environmental regulations and standards (Ilelaboye & Alade, 2022).

Pollution control costs vary depending on factors such as the type and scale of pollution sources, the severity of pollution, the effectiveness of control measures, and regulatory requirements (Mensah & Asante, 2022). Examples of pollution control costs include investments in emission control devices, wastewater treatment plants, pollution abatement technologies, and implementing pollution prevention measures (Khan et al., 2020). Effective pollution control measures not only help to protect the environment and public health but also contribute to regulatory compliance, corporate responsibility, and sustainable business practices (Kolawole et al., 2023).

Theoretical Review

This study reviewed stakeholder theory and is based on its principles.

Stakeholder Theory

The stakeholder theory presents a philosophical framework for organizational governance and corporate ethics, focusing on the ethical dimensions and moral considerations inherent in a corporation's operations. Introduced by Edward Freeman in 1984, this theory emphasizes the significance of stakeholders, defined as

individuals, entities, or groups capable of influencing or being influenced by a company's actions (Dagunduro et al., 2022). According to this perspective, corporations have responsibilities towards a diverse array of stakeholders beyond shareholders, including creditors, customers, suppliers, employees, government entities, the community, the environment, and future generations (Freeman, 1984). Stakeholder theory advocates for businesses to prioritize the interests of all stakeholders and not solely focus on maximizing shareholder value.

Stakeholder theory has found extensive application in the realms of accounting and finance, as evidenced by several empirical studies. For instance, Aremu and Adegbie (2024) investigated the influence of environmental conservation costs on sustainable business practices among listed Nigerian oil and gas companies, employing stakeholder theory as the theoretical framework. Similarly, Kolawole et al. (2023) examined the impact of environmental accounting practices on the financial performance of Nigerian aviation firms, focusing on aspects such as environmental research and development, pollution control policies, and waste management, all within the framework of stakeholder theory. Additionally, Dagunduro et al. (2022) explored the relationship between social responsibility and the financial performance of Micro, Small, and Medium Scale Enterprises (MSMEs) in Nigeria, with stakeholder theory serving as the theoretical foundation for their study.

Stakeholder theory is highly relevant in understanding the relationship between environmental costs and economic value within organizations. By considering the interests and concerns of various stakeholders, including employees, customers, suppliers, local communities, and regulatory authorities, companies can better address environmental challenges while simultaneously creating economic value. Stakeholder engagement helps businesses identify environmental costs associated with activities such as pollution control, waste management, and compliance with regulations. By managing these costs effectively and adopting sustainable practices, companies can enhance their reputation, mitigate risks, and attract investment, thereby contributing to long-term economic value creation. Additionally, stakeholders play a crucial role in holding companies accountable for their environmental impacts, thereby influencing their financial performance and overall sustainability. Therefore, incorporating stakeholder perspectives is essential for businesses to navigate the complex interplay between environmental costs and economic value creation.

In recent years, stakeholder theory has become increasingly intertwined with business practices, highlighting the importance of considering all stakeholders in value creation efforts. Businesses are recognizing the need to address the demands of non-target audiences and are exploring ways to enhance relationships with stakeholders (Murphy et al., 2017). However, criticisms of stakeholder theory have emerged, questioning its ability to effectively balance the interests of diverse stakeholders and manage potential conflicts (Post et al., 2002). Skeptics argue that stakeholder approaches cannot be universally applied across all organizations due to varying stakeholder dynamics, necessitating customized strategies for stakeholder management (Post et al., 2002). Nonetheless, stakeholder theory remains relevant as it offers a comprehensive framework for delineating the relationships between organizations and their stakeholders, underscoring the importance of transparency, integrity, and stakeholder engagement in achieving long-term organizational objectives (Igbekoyi, 2017).

Empirical Review

This research reviewed relevant literature on environmental costs and economic performance in line with the study's specific objectives and hypotheses.

Waste Management Cost and Economic Value

Kolawole et al. (2023) conducted an in-depth analysis of how environmental accounting practices impact the financial performance of Nigerian aviation companies. By examining environmental research and development, pollution control policies, and waste management, the study aimed to determine their effects on return on assets. Using an ex-post facto research design and analyzing data from 2016 to 2021, the study found that investments in environmental research and development and waste management had a negative impact on return on assets. Conversely, pollution control policies positively affected financial performance, indicating that while certain environmental initiatives may be costly, effective pollution control can enhance a firm's financial standing by potentially reducing future liabilities and operational inefficiencies. In a broader context, related studies by Bessong et al. (2023), Akinleye (2022), and Chukwu et al. (2020) offer additional insights into the financial implications of environmental expenditures across various sectors. Bessong et al. found that fines and penalties adversely affected the profits per share of Nigerian oil and gas firms, though costs related to oil spillage and gas flaring did not significantly impact profits.

Akinleye's study on internal environmental costs revealed a significant negative effect on return on assets, highlighting the financial burden of such costs. Chukwu et al. showed that environmental responsibility policies did not substantially influence earnings stability, underscoring the need for a robust regulatory framework for environmental financial reporting. Collectively, these studies emphasize the critical role of proactive environmental management in enhancing financial performance and maintaining regulatory compliance. Complementing these findings, Onyekachi et al. (2020) demonstrated a strong positive correlation between environmental investments and the earnings of Nigerian oil and gas firms, recommending adherence to transparent financial reporting to improve business reputation.

Similarly, Okoro and Okafor (2023) found that waste management costs positively influenced firm performance in Nigeria's manufacturing sector, highlighting the benefits of efficient waste management practices. Mensah and Asante (2022) observed that waste management costs significantly enhanced the market value of firms in Ghana, while Ndlovu and Moyo (2021) reported a positive impact of waste management expenses on firm value in South Africa's construction industry. These studies collectively underscore the importance of strategic environmental investments and effective waste management practices in driving financial performance and sustainability across different industries.

Previous empirical studies like Kolawole et al. (2023) have explored the effects of waste management on financial performance in specific sectors such as aviation, manufacturing, and construction, research focusing on multinational corporations in Nigeria is lacking. Additionally, previous studies have mainly concentrated on traditional financial performance indicators such as return on assets, profits per share, and market value. This study

seeks to provide a more comprehensive analysis by including a broader range of economic value metric, such as economic value added (EVA), to offer a holistic understanding of how waste management affects the overall economic value of multinational corporations in Nigeria. Based on the above fact, it was hypothesized that:

- ***H_1:*** *Waste management cost has a significant effect on economic value of listed multinational corporations in Nigeria.*

Environmental Remediation Cost and Economic Value

Aremu and Adegbie's (2024) study delved into the intricate relationship between environmental conservation costs and the sustainable growth of publicly traded Nigerian oil and gas companies. By examining variables like community development costs, pollution expenses, and environmental remediation costs, they sought to understand how these factors influence indicators of sustainable business expansion, such as return on assets and gross margin return on investment (GMRI). Their findings, derived from data spanning over a decade and analyzed through regression analysis, uncovered significant associations. Notably, community development costs and pollution expenses demonstrated positive correlations with GMRI, indicating a favorable impact on sustainable business growth. However, the study also revealed a negative relationship between environmental remediation costs and GMRI, suggesting that such expenditures may hinder long-term economic value creation within these firms. The findings corroborate with findings of Boluwaji et al. (2024), which found that sustainable business practices significantly influence going concern of listed manufacturing firms in Nigeria.

In parallel research, Smith and Johnson (2023) explored the impact of environmental remediation costs on economic value in U.S. manufacturing firms, emphasizing the potential for strategic investments in cleanup activities to enhance long-term economic value. Similarly, Garcia and Martinez (2022) focused on European oil and gas companies, revealing how prioritizing remediation efforts can lead to improved long-term performance despite initial financial strains. Chen and Wang (2021) extended this inquiry to manufacturing enterprises in China, highlighting the importance of effective cost management strategies for environmental cleanup activities in driving economic value creation. Moreover, Kim and Lee (2020) delved into the construction industry in South Korea, underscoring the benefits of proactive remediation efforts in fostering sustainable operations and enhancing economic value. Together, these studies underscore the critical role of proactive environmental management in driving financial performance and maintaining regulatory compliance across various industries and geographic regions.

Aremu and Adegbie (2024) examined how environmental conservation costs influence sustainable growth in Nigerian oil and gas companies, highlighting the need for further research on how environmental remediation activities affect the economic value of multinational corporations in Nigeria. Multinational corporations encounter distinct challenges and opportunities compared to domestic firms due to varying regulatory environments, stakeholder expectations, and operational complexities. Consequently, understanding the specific implications of environmental remediation on the economic value of multinational corporations in Nigeria is essential for developing tailored strategies to foster sustainable growth and mitigate potential risks. Despite existing studies exploring the impact of environmental remediation on economic value in different industries and regions, there is a notable gap in research focusing on multinational corporations operating in emerging markets like Nigeria. Therefore, the study seeks to fill this gap by investigating the economic implications of environmental remediation costs on multinational corporations in emerging market economies like Nigeria. Based on the above statements, it was hypothesized that:

- ***H_2:*** *Environmental remediation cost has a significant effect on economic value of listed multinational corporations in Nigeria.*

Pollution Control Cost and Economic Value

Igbekoyi et al. (2021) examined how environmental accounting disclosure affects the financial performance of multinational corporations in Nigeria, utilizing data from their annual reports spanning a ten-year period. Through descriptive statistics and panel regression analysis, they discovered a significant and positive relationship with earnings per share (EPS) but remained uncertain about its impact on return on assets (ROA). Their study underscores the importance of transparent environmental accounting practices for multinational corporations, which could potentially strengthen their connections with shareholders and stakeholders. Conversely, Aremu and Adegbie's (2024) investigation focused on the connection between environmental conservation costs and the sustainable growth of Nigerian oil and gas companies. They uncovered positive correlations between community development costs and pollution expenses with gross margin return on investment (GMRI), though environmental remediation costs exhibited a negative association. These findings contribute to understanding the proactive role of environmental management in driving financial performance and regulatory compliance, highlighting the significance of strategic environmental investments and efficient waste management practices in fostering sustainability and financial prosperity across industries.

Additionally, parallel studies by Kolawole et al. (2023) examined how environmental accounting practices intersect with the financial performance of Nigerian aviation companies, revealing insights into the effects of environmental research and development, pollution control policies, and waste management on return on assets. Despite adverse impacts from investments in environmental research and development and waste management, pollution control policies emerged as a positive influence, accentuating the benefits of effective pollution control measures. Related research by Bessong et al. (2023), Akinleye (2022), and Chukwu et al. (2020) further emphasized the importance of proactive environmental management in enhancing financial performance and ensuring regulatory compliance across diverse sectors, emphasizing the necessity of strategic environmental investments and efficient waste management practices for driving sustainability and financial well-being. Based on the empirical findings, it was hypothesized that:

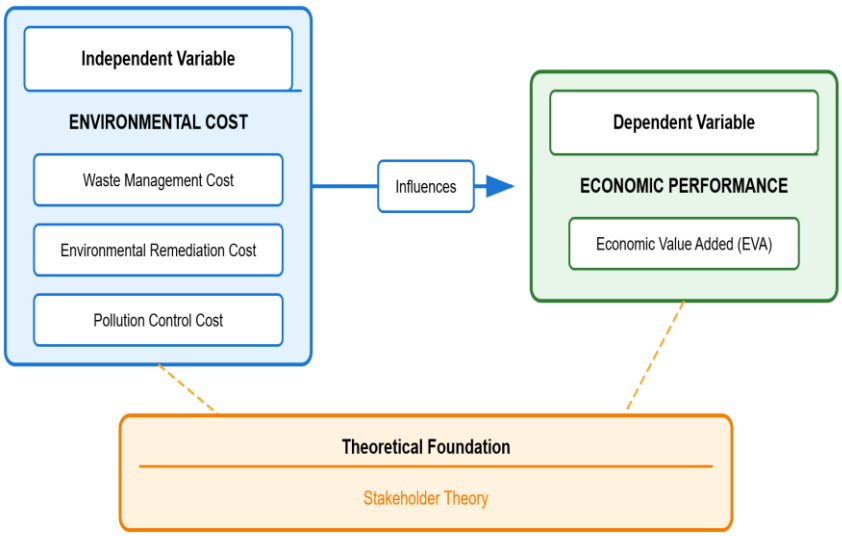
- ***H_3:*** *Pollution Control cost has a significant effect on economic value of listed multinational corporations in Nigeria.*

Conceptual Framework

The relationship among the variables examined in this study is illustrated in Figure 1. Waste management cost,

environmental remediation cost, and pollution control cost constitute independent variables representing environmental cost, while economic performance measured using Economic Value Added (EVA) serves as the dependent variable. This relationship is grounded in stakeholder theory, which argues that organisations can achieve stronger economic outcomes when they address stakeholders' environmental concerns through responsible accounting practices.

Figure 1: Conceptual Framework



Source: Researcher's Conceptualization (2025)

Methodology

This study adopted an expo-facto research design. The use of an *expo-facto* research design in this study is justified as it allows for the analysis of pre-existing data to identify relationships between variables without manipulating the study environment. This approach is ideal for examining historical data on economic performance and sustainability practices, as it uses actual records, ensuring the findings are grounded in real-world contexts. Data from financial, sustainability, and corporate social responsibility reports provide comprehensive sources for evaluating the firms' practices and performance. The study's population comprised 55 multinational corporations listed on the Nigerian Exchange Group (NGX) as at 31st December, 2023 and 44 firms that fully complied with sustainability reporting were selected using purposive sampling technique. The study spanned a twelve-year period from 2012 to 2023, allows for the observation of trends, patterns, and long-term impacts, providing a robust analysis of the evolution of corporate practices and their outcomes.

Model Specification

This research modified the Aremu and Adegbie (2024) model, which described sustainable business growth as a function of environmental cost as shown in equation (i).

$$GMRIit = \beta_0 + \beta_1 CDCit + \beta_2 PCit + \beta_3 ERCit + \varepsilon it \quad \text{——— (i)}$$

However, for the purpose of this study, the researcher has decided to use Economic Value Added (EVA) as a measure of economic performance as the dependent variable in this study, while Waste Management Cost (WMC), Pollution Control Cost (PCC) and Environmental Remediation Cost (ERC) are used to measure environmental cost, the independent variable. This will now made the adopted model in equation (i) to be represented thus:

$$EP_{it} = \beta_0 + \beta_1 WMC_{it} + \beta_2 PC_{it} + \beta_3 ERC_{it} + \varepsilon_{it} \quad \text{—— (ii)}$$

Where:

EP = Economic Performance

WMC = Waste Management Cost

PCC = Pollution Control Cost

ERC = Environmental Remediation Cost

RCGD = Risk Committee Gender Diversity

Σ = Stochastic Error Term

β_0 = Intercept

$\beta 1, \beta 2, \beta 3$ = The Coefficients of the independent variable

The *a-priori* expectation = $\beta 1, \beta 2, \beta 3 > 0$, this suggests that a positive correlation is anticipated between the explanatory variables and the dependent variable.

Measurement and Description of Variables

Table 1 shows the description, measurement, data source, and literature evidence of the investigated variables.

Table 1: Description and Measurements of Variables

SN	Variables	Description	Measurements	Data Source	Literature Evidence
1a	Economic Value Added (EVA)	EVA (Economic Value Added) is a metric that evaluates a company's financial performance by focusing on the creation of shareholder value. It measures whether the company has generated returns exceeding its cost of capital.	To calculate EVA, the company's cost of capital is subtracted from its net operating profit after taxes (NOPAT), and the result is multiplied by the total invested capital. The formula for EVA is = NOPAT - (Cost of Capital × Total Invested Capital).	Annual Reports.	Adekunle and Yusuf (2022); Kim and Lee (2020)
2a	Waste Management Cost (WMC)	Waste management costs are the costs associated with the collection, processing, recycling, and disposal of waste generated by the company.	The calculation for Waste Management Cost involves identifying and quantifying the various cost incurred by a company in managing its waste divided by total expenses.	Sustainability Reporting.	Kolawole et al. (2023); Ndlovu and Moyo (2021); Okoro and Okafor (2023)
2b	Pollution Control Cost (PCC)	Pollution Control Cost refers to the cost incurred by a company in implementing measures and initiatives aimed at preventing, reducing, or mitigating pollution from its operations.	Pollution control cost involves identifying and summing up all the cost associated with efforts to control, mitigate, and manage pollution and divided by total cost.	Annual Reports.	Aremu and Adegbie (2024); Bessong et al. (2023)
2c	Environmental Remediation Cost (ERC)	Environmental Remediation Cost refers to the cost incurred by a company in addressing and cleaning up environmental contamination or pollution caused by its operations.	Environmental remediation cost involves all cost associated with the cleanup, restoration, and mitigation of environmental damage and divided by total cost.	Annual Reports.	Aremu and Adegbie (2024); Bessong et al. (2023)

Source: Authors' Compilation (2024)

Data Analysis Techniques

This study employed descriptive statistics (mean, median, variance, standard deviation, skewness, and kurtosis) and inferential statistics (panel regression analysis, correlational analysis etc.) to conduct data analysis.

Data Analysis and Discussion of Findings

This section describes the features of variables used, data analysis and study findings.

Descriptive Statistics

The descriptive analysis of variables is reported in Table 2. The results shows that economic performance measured by economic value added (EVA) of the firms sampled on the average is 0.456 which is positive with standard deviation of 1.205 and this indicate that most of the multinational companies has a positive value added and high variability in economic value added considering the distance from the mean value. The sampled firms while the standard error of mean implied that the sample mean is a reflection of the actual population having a small value close to zero (0) indicating 0.0524. Multinational firms with the least economic value added (EVA) showing -1.760 and maximum of 6.9087. The total sum of economic value added (EVA) is 241.18 and the data is positively skewed and have abnormal distribution. From Table 2, it is observed that waste management cost (WMGC) for sampled firms on the average is 1.668 with standard deviation of 2.5796. The standard deviation value shows that there is high variability in the level of waste management cost (WMGC) across the sampled multinational firms while the standard error of mean implied that the sample mean is a reflection of the actual population having a small value compared to the mean 0.1122. Multinational firms with the least waste management cost (WMGC) have 0 while the maximum waste management cost

(WMGC) is 8.2271 and the total sum of the waste management cost (WMGC) represent 880.90. The data is positively skewed and normally distributed.

Furthermore, on Table 2, it is observed that pollution control cost (PLCT) for sampled firms on the average is 5.434 with standard deviation of 2.168. The standard deviation value shows that there is moderate variability in the pollution control cost (PLCT) made by the manufacturing firms in their annual reports while the standard error of mean implied that the sample mean reflects the actual population having a small value compared to the mean 0.0943. Multinational firms with the least pollution control cost (PLCT) have 0 while the maximum pollution control cost (PLCT) is 9.245 and the total sum of the pollution control cost (PLCT) is 2869.3. The data is positively skewed and normally distributed. Lastly on Table 2, the environmental remediation cost (EVRMC) on the average is 4.3838 with standard deviation of 2.659 which imply that there is moderate variability in the environmental remediation cost (EVRMC) made by the multinational firms in their annual reports while the standard error of mean implied that the sample mean reflects the actual population having a small value compared to the mean 0.11575. Multinational firms with the least environmental remediation cost (EVRMC) have 0 while the maximum environmental remediation cost (EVRMC) is 8.820 and the total sum of the 8.820 is 2314. The data is negatively skewed and normally distributed.

Table 2: Descriptive Statistics

Stats	EVA	WMGC	PCC	ERC
Obs	528	528	528	528
Mean	0.4568	1.6684	5.4343	4.3839
S.D.	1.2054	2.5796	2.1682	2.6598
Se(mean)	0.0525	0.1123	0.0944	0.1158
Min	-1.8	0	0	0
Max	6.9088	8.2272	9.2457	8.8207
Sum	241.19	880.91	2869.33	2314.70
Skewness	2.9448	1.0128	-1.2328	-0.6364
Kurtosis	15.9162	2.2763	4.1774	2.1593

The table shows the results analysis of mean, number of observations, minimum and maximum statistics, standard deviation, skewness, and kurtosis.

Source: Researcher's Computation (2024)

Test of Variables

To ensure a robust regression analysis, all variables were evaluated to validate the analysis's assumptions. This includes pre- and post-estimation tests, as they are critical for accurate estimation.

Pre-estimation Test

The following tests were performed to ensure that the selected model's assumptions were met, and that the data chosen was appropriate for analysis. They also help to prevent misspecification errors and ensure the model's outcomes are valid.

Unit Root Test

Panel variables have the tendency of been nonstationary at level which may likely affect the parameter stability and consistency of the model. However, to identify the stationary conditions of the variables, the study uses Levin-Lin-Chu unit-root test. The null hypothesis assumption of the unit root test is that all panels contain unit roots while the alternate hypothesis implies that some panels are stationary. The results of unit root tests were displayed in Table 3. It shows that all the variables are integrated of order zero that is 1(0) which is significant at 5 percent level of significance. Therefore, we reject the null hypothesis and conclude that the series is stationary. Therefore, it is not necessary to conduct the co-integration test to determine the long run relationship among the variables. The panel least square can estimate an efficient model and that is less spurious.

Table 3: Panel Unit Root Test

Variable	Levin-Lin-Chu unit-root test	
	z-statistics	P-value
EVA	-9.7468	0.0000
WMGC	-21.6520	0.0000
PLCT	-22.5077	0.0000
EVRM	-3.9462	0.0000

The table shows the results analysis of unit root tests conducted for this study.

Source: Researcher's Computation (2024)

Correlation Analysis

Table 4 shows the results of a pairwise correlation coefficient test to determine the linear relationship between economic performance and environmental cost. The data revealed an inverse and significant relationship between waste management cost (WMC) and economic value added (EVA) as evidenced by the coefficient value of -0.1113 and probability of 0.0105. Furthermore, it is demonstrated that for multinational firms, there is a negative correlation between economic value added (EVA) and pollution control cost (PCC) with a coefficient value of -0.2038 indicating an inverse relationship because an increase in pollution control cost (PCC) will result to 20.38 percent decrease in economic value added (EVA). Furthermore, Table 3 shows a negative association between the environmental remediation cost (ERC) of listed multinational firms and economic performance measured by economic value added (EVA). The results are evidenced with a coefficient -0.1273 and p-value of 0.0034 which imply insignificant correlation. Furthermore, Table 3 shows a positive linear association between the environmental remediation cost (ERC) of listed multinational firms and economic performance measured by economic value added (EVA). The overall implication of this relationships is that all forms of environmental cost will lead to reduction in economic performance and the increase in this environmental cost in waste management, pollution control and environmental remediation will reduce the economic value of the firms.

Table 4: Correlation Analysis of Study Variables

Variables	Pairwise Correlation	EVA	WMC	PCC	ERC
TobinQ	Coefficient Sig.	1.0000 -			
WMC	Coefficient Sig.	-0.1113* (0.0105)	1.0000 -		
PCC	Coefficient Sig.	-0.2038* (0.0000)	0.1025* (0.0185)	1.0000 -	
ERC	Coefficient Sig.	-0.1273* (0.0034)	-0.1333* (0.0021)	0.5730* (0.0000)	1.0000 -

The table shows the results of pairwise correlation coefficient of the investigated variables in this study.

Source: Researcher's Computation (2024)

Post Estimation Test

Error test for model specification is conducted using Ramsey RESET test. The results show probability of 0.1219 and this indicate that the model has no omitted variable bias. The heteroscedasticity test was conducted to check the validity of homoscedasticity assumption that variance in the residuals is constant. Heteroscedasticity test was conducted using Breusch-Pagan/Cook-Weisberg test and the result is presented in Table 5. Data for the study revealed the presence of heteroscedasticity given the probability value of 0.0000 which is lower than 0.05. Likewise, variables for the study is also tested for auto-correlation using Wooldridge test for autocorrelation in panel data. Autocorrelation depicts how closely variable values are correlated across time. The result is presented in Table 5 and it shows the probability of 0.0161 which is significant indicating that there is problem of Auto-correlation hence the null hypothesis that there is no first-order correlation is rejected.

Furthermore, the cross-sectional dependence test is carried out and the result is presented in Table 5. The result indicates that null hypothesis which implied there is no cross-sectional dependence is rejected as the statistics shows 3.674 with probability value indicated 0.0002. Hence, there is sufficient evidence to conclude that environmental cost under fixed- effect condition exhibits cross-sectional dependence. However, the observed estimation problem are to be corrected using panels corrected standard errors (PSCE) with the option that the standard error is independent-corrected. The Hausman test was also conducted to specify the appropriate model between fixed-effect model and random effect model and the result favoured the random effect model as the probability shows 0.3919 implying that difference in coefficient is not systematic. The appropriate model between random effect and polled OLS regression examined using Breusch and Pagan Lagrangian multiplier test for random effects and the result shows that random effect is most appropriate as the probability is significant showing p-value of 0.0000 supporting the null hypothesis.

Table 5: Summary of Post Estimation Test Results

Ramsey RESET test		
Null Hypothesis	F-Statistics	Probability
Ho: model has no omitted variables (P>0.05)	1.94	0.1219
Tolerance and VIF Value		
Null Hypothesis	VIF	Mean VIF
There is no multicollinearity among the variables (1/VIF >0.10)	-	1.40
Breusch-Pagan / Cook-Weisberg test for Heteroscedasticity		
Null Hypothesis	Chi2 Statistics	Probability
Constant variance across the variables residuals (P>0.05)	110.51	0.0000
Wooldridge test for autocorrelation		
Null Hypothesis	F-Statistics	Probability
No first-order autocorrelation (P>0.05)	6.282	0.0161
Pesaran's test of cross sectional independence		
Null Hypothesis	Statistics	Probability
There is no cross-sectional dependence (P>0.05)	3.674	0.0002
Hausman Test		
Null Hypothesis	Statistics	Probability
Difference in coefficients not systematic (P>0.05)	3.0	0.3919
Breusch and Pagan Lagrangian multiplier test for random effects		
Null Hypothesis	Statistics	Probability
Difference in coefficients not systematic (P<0.05)	272.89	0.0000

The table shows the results analysis of post estimation texts conducted for this study.

Source: Researchers' Computation (2024)

Fixed- Effect Model Test, Random-Effect and Pooled Ordinary Least Square

The model explaining the linearity of the environmental cost and economic performance is significant for the three model as the F-statistics shows that the model is different from zero and the probability is significant. Since the fixed effect is tagged a within regression, the R-square indicated 3.37 percent, this implies a very low variation in the outcome variable caused by the joint explanatory variables. For the random-effect model, the R-square indicated 4.19 percent, this implies a very low variation in the outcome variable caused by the joint explanatory variables. Likewise for Pooled OLS regression, the R-square indicated 5.10 percent, this implies a moderate variation in the outcome variable caused by the joint explanatory variables. Considering the individual effect of environmental cost, the result shows that environmental waste management cost (WMC) has positive and insignificant effect on economic performance measured as economic value added (EVA) showing t-statistics of 0.75 and p-value of 0.455. Likewise, pollution cost (PCC) has negative and significant effect on the economic performance measured as economic value added (EVA) among multinational companies in Nigeria under a fixed effect and this is evidenced by t-statistics of -2.97 and p-value of 0.003. More so, it is evident that environmental remediation cost (ERC) has positive and insignificant effect on economic value added (EVA) indicating t-statistics of 0.23 and p-value of 0.821.

Furthermore, from Table 6 where the results from the random-effect of the linear regression is presented, it shows that environmental waste management cost (WMC) has negative and insignificant effect on economic performance measured as economic value added (EVA) showing z-statistics of 0.04 and p-value of 0.972. Likewise, pollution cost (PCC) has negative and significant effect on the economic performance measured as economic value added (EVA) among multinational companies in Nigeria under a fixed effect and this is evidenced by z-statistics of -3.11 and p-value of 0.002. More so, it is evident that environmental remediation cost (ERC) has negative and insignificant effect on economic value added (EVA) indicating z-statistics of 0.00 and p-value of 1.000.

Lastly, the result shows that environmental waste management cost (WMC) has negative and significant effect on economic performance measured as economic value added (EVA) showing t-statistics of -2.27 and p-value of 0.023. Likewise, pollution cost (PCC) has negative and significant effect on the economic performance measured as economic value added (EVA) among multinational companies in Nigeria under a fixed effect and this is evidenced by t-statistics of -3.16 and p-value of 0.002. More so, it is evident that environmental remediation cost (ERC) has negative and insignificant effect on economic value added (EVA) indicating t-statistics of -0.83 and p-value of 0.407.

Table 6: Regression Results

	Fixed-Effect Model			Random-Effect Model			Pooled OLS Model		
EVA	Coeff.	t	P>|t|	Coeff.	z	P>z	Coeff.	t	P>|t|
WMC	0.0219	0.75	0.455	-0.001	-0.04	0.972	-0.0467	-2.27	0.024
PCC	-0.107	-2.97	0.003	-0.103	-3.11	0.002	-0.0935	-3.16	0.002
ERC	0.0086	0.23	0.821	0.000	0.03	0.000	-0.0201	-0.83	0.407
_cons	0.9691	6.54	0.000	1.016	5.81	0.000	1.1308	8.02	0.000
R-squared	=	0.0337		R-squared	=	0.0419	R-squared	=	0.0510
F(3,481))	=	5.59		Wald chi2(3)	=	18.65	F(3, 524)	=	9.39
Prob > F	=	0.0009		Prob > chi2	=	0.0003	Prob > F	=	0.0000

The table shows the regression results of fixed effect model, random effect model, and pool OLS model.

Source: Researcher's Computation (2024)

Environmental Cost and Economic Performance of Listed Multinational Corporations in Nigeria

The model expressing the linear relationship between environmental cost and economic performance was analyzed using panel corrected standard error regression after correcting observed statistical problems identified. Probability value and the Z-statistics is used as the indices of interpretation for the linear relationship. The overall result shows that environmental cost have significant effect on economic performance. This is evidenced by the Wald chi2 (3) which is significant, and this imply that the model analyzed is significant at 5 percent. The R-square is 0.0599 which imply that the variance that can be caused in economic performance by environmental cost is 5.99 percent. The overall findings shows that when environmental cost is made, there is significant decrease in the economic performance of firms in terms of ability to generate wealth and distribute resources efficiently.

The regression result shows that waste management cost (WMC) has negative and insignificant effect on market performance (Tobin's Q) having z-statistics of -0.67 and probability of 0.500. The implication of the result is that the financial resources allocated to various processes involved such as managing waste, recycling and landfilling by multinational cost does not promote conservation but rather increase operation cost as the firms have not been able to reduce to the barest minimum their environmental impacts. The findings align with the findings of Kolawole et al. (2023) which found that investments in environmental research and development and waste management had a negative impact on return on assets. In a broader context, related studies by Bessong et al. (2023), Akinleye (2022), and Chukwu et al. (2020) offer additional insights into the financial implications of environmental expenditures across various sectors. Bessong et al. found that fines and penalties adversely affected the profits per share of Nigerian oil and gas firms, though costs related to oil spillage and gas flaring did not significantly impact profits. However, the findings negate the findings of Okafor (2023) which found that waste management costs positively influenced firm performance in Nigeria's manufacturing sector, highlighting the benefits of efficient waste management practices. Mensah and Asante (2022) observed that waste management costs significantly enhanced the market value of firms in Ghana, while Ndlovu and Moyo (2021) reported a positive impact of waste management expenses on firm value in South Africa's construction industry.

Also, the result presented on Table 7 shows that pollution control cost (PCC) has z-statistics of -3.11 and P-value of 0.002 and this indicate negative and significant effect on economic performance (PCC). This indicates that there is observed deficiency in the activities done for pollution control making the cost of production very high and this cannot be considered economically viable to yield enough goodwill that can boost the firm economic performance, hereby leading to negative economic value added. The results are consistent with the findings of Kolawole et al. (2023) which found that investments in environmental research and development and waste management, pollution control policies emerged as a positive influence, accentuating the benefits of effective pollution control measures. Related research by Bessong et al. (2023), Akinleye (2022), and Chukwu et al. (2020) further emphasized the importance of proactive environmental management in enhancing financial performance and ensuring regulatory compliance across diverse sectors

Lastly on Table 7, it is shown that environmental remediation cost (ERC) has positive effect but insignificant effect on the economic performance of listed multinational firms in Nigeria. This is evidenced by z-statistics of 0.82 and probability value of 0.409. This implies that firms' expenses incurred in restoring or mitigating environmental damage caused by pollution, contamination are essential for mitigating environmental risks and contributing positively to the ecosystems. This effort has led to the overall success of multinational firms in delivering economic value even though not significantly to owners. The results contradict the findings of Smith and Johnson (2023) which explored the impact of environmental remediation costs on economic value in U.S. manufacturing firms, emphasizing the potential for strategic investments in cleanup activities to enhance long-term economic value. Similarly, Garcia and Martinez (2022) focused on European oil and gas companies, revealing how prioritizing remediation

efforts can lead to improved long-term performance despite initial financial strains.

Table 7: Panels Corrected Standard Errors Regression

EVA	Coef.	Panel--corrected Std. Err	z	P>|z|
WMC	-0.0138	0.0205	-0.67	0.500
PCC	-0.1057	0.0340	-3.11	0.002
ERC	0.0231	0.0280	0.82	0.409
_cons	0.9653	0.1674	5.76	0.000
OBS	= 528	Number of groups	= 44	
R-squared	= 0.0599			
Wald chi2(3)	= 12.93	Prob > chi2	= 0.0048	

The table shows the regression results analysis of the investigated variables in this study with their level of significant effect at 5% or 0.05.

Source: Researcher's Computation (2024)

Discussion of Findings

The empirical findings reveal that pollution control costs have a negative and significant impact on the economic performance of listed multinational firms in Nigeria, indicating that expenses related to managing pollution, such as investments in cleaner technologies and regulatory compliance, significantly reduce profitability. This suggests that pollution control is a substantial cost without immediate financial returns, though necessary to avoid legal and environmental consequences. Waste management costs, while also negatively affecting economic performance, were found to be insignificant, implying that these costs are relatively manageable and do not strongly impact the firms' financial health. Lastly, environmental remediation costs showed a positive but insignificant effect on economic performance, suggesting that while remediation efforts may offer slight benefits, they do not significantly boost short-term profitability. This could point to potential long-term gains that are not yet reflected in the current financial metrics.

The policy implications of these findings suggest that multinational firms in Nigeria should carefully manage and communicate their environmental strategies to achieve a balance between regulatory compliance, sustainability, and economic performance. The study highlights that environmental costs currently pose a financial burden on these firms without yielding long-term benefits. It is essential for management to re-evaluate their environmental spending to ensure that stakeholder needs are met cost-effectively while maximizing shareholder wealth through positive economic value addition. Multinational firms, already familiar with international environmental standards, should partner with non-governmental organizations to obtain certifications for best practices, which could help them reduce unethical production and increase economic gains from environmental investments. Additionally, companies should focus on environmental remediation and adopt modern technology to reduce pollution, restore previously damaged environments, and enhance their economic performance. This approach would demonstrate their commitment to sustainable business practices, positively influencing investor confidence.

The findings are consistent with stakeholder theory, which advocates for firms to consider the needs of all stakeholders, not just shareholders, for long-term success. The significant negative impact of pollution control costs on economic performance reflects a firm's commitment to societal and environmental responsibilities, even if it reduces short-term profitability. This aligns with the theory's view that fulfilling obligations to regulators, communities, and environmental groups is essential for maintaining legitimacy. The insignificant impact of waste management costs suggests these are routine expenditures that don't significantly alter financial health, indicating a balance between stakeholder interests and financial performance. Meanwhile, the positive but insignificant effect of environmental remediation costs implies that while such efforts may eventually benefit stakeholders and enhance corporate reputation, their financial benefits are not yet evident. This highlights the theory's focus on long-term stakeholder relationships and the potential future rewards of investing in environmental sustainability.

Conclusion and Recommendations

The study examined the effect of environmental cost on economic performance of multinational firms in Nigeria. Understanding how companies handle environmental expenses to capitalize on opportunities to improve economic performance is vital for shaping regulatory frameworks geared towards fostering sustainable development in Nigeria. The study is motivated from the fact that the multinational companies have extensive influence in various sectors like oil and gas, manufacturing, and finance across the Nigeria economy and linking their cost to the economic value added will help them to strike a balance between safeguarding the environment and fostering economic growth. Employing expo-facto research design and sourcing data secondarily from annual reports, obtained data for 44 firms was analyzed. The empirical findings revealed that pollution control costs had negative and significant impact on the economic performance. Waste management costs found to have a negative but insignificant effect, while environmental remediation costs had positive yet insignificant effect on economic performance. The study concluded that Nigerian multinational companies mean of addressing environmental challenge by committing cost to pollution control has no economic value and it negatively influence the firms' economic performance.

Based on the study findings, it is then recommended that management should adopt strategy for efficient waste management practices to promote resource conservation and reduce the negative impact of the waste management cost on economic value added. Secondly, management should see to the restructuring of economic activities so that the company will spend less on pollution control and reduce the adverse effect of such expenditure on economic performance of the firms. Lastly, management should commit

more financial resources to activities aimed at improving and maintenance of environmental condition of their host community to have significant increase in its economic value.

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