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POLLUTION CONTROL COSTS DISCLOSURE AND RETURN ON ASSETS OF LISTED OIL AND GAS COMPANIES IN RIVERS STATE, NIGERIA

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Abstract
The research examines the relationship between disclosure of pollution control costs and ROA in oil and gas industries in Rivers State, Nigeria. The stakeholder theory is used as a theoretical basis for the study. The study adopted an ex-post facto and correlation type of research designs. The study focuses on five oil and gas companies quoted in the Nigerian Exchange Group (NGX) in the year 2025. A total of sixty-five samples are analyzed based on thirteen years' data through census sampling technique. Secondary data is collected from published annual reports of these companies in the Nigerian Stock Exchange. Descriptive statistic, Augmented Dickey Fuller test, Hausman tests and regression methods for fixed and random effects are employed in this study. The result reveals that legal compliance cost has a significantly positive effect on the average total asset in these companies in Rivers State. Community development investment cost has a significantly positive effect on the average total asset in these companies in Rivers State. Waste management cost has positively affected the average total asset in these companies in Rivers State..

Keywords: Pollution control costs disclosure, Return on Assets, Legal compliance cost, Community Development cost, Waste management expenditure.

Introduction

The fact is that the state of Rivers in Nigeria has an abundant supply of natural resources such as oil and gas, thus creating a thriving oil and gas industry in the state. The connection between pollution control cost disclosure and the Return on Assets ratio in oil and gas companies listed at the stock exchange in Nigeria, therefore, acquires great importance. Indeed, various difficulties connected with pollution control exist in the oil and gas industry, including regulatory, waste disposal, and community development ones. Such pollution control activities require a lot of money, which can directly affect the financial situation of the firm and, thus, require further research (Ibrahim & Bello, 2023; Ibrahim & Suleiman, 2024; Musa & Bello, 2023; Musa & Bello, 2024; Ojo & Adeyemi, 2024).

According to Abdullahi and Muhammad (2023), ROA provides some valuable information regarding the economy and profitability of oil and gas enterprises. However, it still remains unclear whether the pollution control costs can have an impact on ROA in those firms. Therefore, further research on the topic is necessary. The unique environment in Rivers State requires a special approach to the investigation of the issue (Fatimah & Uzo 2023).

Statement of the Problem.

Environmental accounting regulations in Rivers State are inadequate, although the government has attempted various regulations like the Environmental Impact Assessment Act of 2004 and other policies meant to facilitate sustainability. Nonetheless, businesses in Rivers State abide by accounting principles based on the Global Reporting Initiative (GRI). In Rivers State, pollution control cost is common in oil and gas companies due to regulatory compliance, environmental management, and community development activities.

According to Ige and Lawal (2022), although pollution control cost is an increasingly important phenomenon in the global economy because of its role in enhancing sustainability and environmental management, there is little empirical literature on how pollution control cost affects the return on assets of oil and gas companies in Rivers State. Though the oil and gas industry is crucial for the economic growth of Rivers State, pollution control cost resulting from compliance issues, waste management, and community development presents financial difficulties for companies in the oil and gas industry (Akinyele & Eze, 2024; Chukwu & Ogunleye, 2022; Fatimah & Uzo, 2023; Ibrahim & Ayinde, 2024; Akintoye & Hassan, 2023; Abubakar & Sadiq, 2023).

Bamishe and Adegbie (2024) suggest that some organizations might be reluctant to disclose information about pollution control cost because such action could cause investors' displeasure that would affect decision-making. On the other hand, there is a rise in the number of companies that disclose pollution control costs because it makes it easy for investors to understand their risk and opportunities. According to Ojo and Adeyemi (2024), a firm unable to meet pollution control standards is likely to have a poor management system, making the organization unable to withstand environmental risks and take advantage of the sustainable economy. Firm size is likely to mediate this relationship because large corporations will manage the cost of pollution control effectively, while small businesses will suffer significantly. Existing literature shows a lack of empirical evidence to support this phenomenon in Rivers State.

Conceptual Framework

A Conceptual framework showing the dimension/measures the effect of pollution control costs disclosure on Return on Assets of oil and gas Companies in Rivers State, Nigeria.

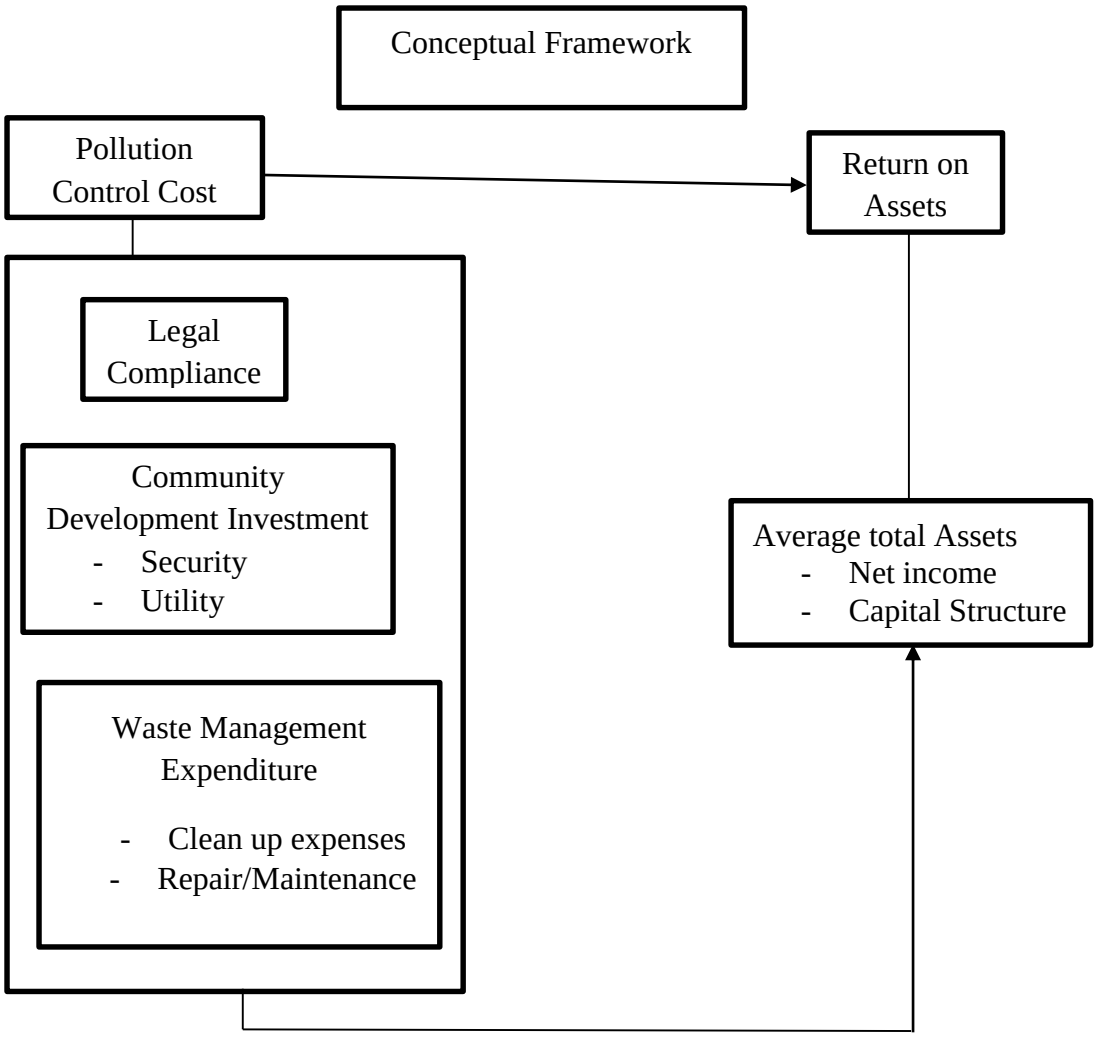

Fig1.1.

Purpose Of The Study

This study evaluates the relationship between pollution control cost disclosure and return on assets in oil and gas organizations in Rivers State, Nigeria. The objectives include:

1. Assessing the impact of legal compliance costs on the average total assets of oil and gas organizations in Rivers State.
2. Assessing the impact of community development costs on the average total assets of these organizations.
3. Assessing the impact of waste management costs on the average total assets of these organizations.

Research Questions

1. What is the effect of legal compliance costs on the average total assets of oil and gas organizations in Rivers State?
2. What is the effect of community development costs on the average total assets of oil and gas organizations in Rivers State?
3. What is the effect of waste management costs on the average total assets of these organizations?

Research Hypotheses

Ho1: Legal compliance costs do not significantly affect the average total assets of oil and gas organizations in Rivers State.
Ho2: Community development costs do not significantly affect the average total assets of these organizations.
Ho3: Waste management costs do not significantly affect the average total assets of these organizations.

Scope of Study

The scope of the study can be determined by the following factors: (i) geographical scope, (ii) theoretical scope, and (iii) unit of analysis.

i) Geographical scope: The scope of the study is oil and gas organizations listed in the Nigeria Stock Exchange (NSE). Information is gathered through their annual reports.

ii) Theoretical scope: The theory concerns pollution control cost disclosure. This is made up of the following subcomponents: legal compliance costs, community development investment, and waste management costs. This is measured against the dependent variable that is the average total assets, net income, and capital structure.

iii) Unit scope: This is a unit of organization. Groups and individuals are not considered as separate units of analysis.

2 . REVIEW OF RELATED LITERATURE

Conceptual Review

Pollution control costs

This part deals with the aggregate direct and indirect economic costs undertaken by governmental agencies and other organizations meant to prevent, reduce, or stop environmental pollution. The costs involve financial investments in technology (such as smokestack scrubbers) and others. Ojo and Adeyemi (2024) argue that pollution control cost involves the financial costs involved in mitigating and managing the effects of production and environmental regulation, resource protection, and other sustainable processes (Adeyemi and Eze, 2023).

Return on Assets (ROA)

Return on assets is the measure of a firm's efficiency in using its asset base to earn the necessary income. According to Palepu et al. (2010), return on asset ratio is vital for both stockholders and creditor. Return on assets ratio reflects on how efficiently the firm has used its resources. Financial analysts use return on assets to evaluate the operating efficiency of a business with respect to asset management. The ratio evaluates a company's operating efficiency relative to its level of investment irrespective of the source of financing either in terms of equity or debt (Stickney, 1996). Return on assets provides an evaluation tool used to gauge a company's efficiency in earning profit from assets controlled.

If the return on assets ratio percentage is higher, it implies better efficiency, but low percentages denote the lack of efficient asset utilization. This is in line with the observation made by Gul et al. (2011) that a higher return on assets means better asset efficiency in making a profit on each dollar spent on asset acquisition. ROA shows capital intensity of the firm that varies depending on the business. Those firms that require large capital intensities tend to have relatively lower return on

assets. Return on assets ratios that exceed 5 percent are considered good, with higher ratios reflecting increased profit since most gains emanate from smaller asset sizes (Ang, 1997).

ROA measures the overall efficiency of the management in ensuring a profitable operation by utilizing the assets available. Positive ROA implies profitability relative to the total assets being used in operations. Negative ROA, however, denotes losses made from asset utilization. ROA is computed as follows:

Return on Assets (ROA)= $\frac{\text{Profit before Tax}}{\text{Total Assets.}} \times 100$

Theoretical Review

Stakeholder Theory

According to stateholder theory developed in 1984 by R. Edward Freeman, a main goal of a firm is to meet the demands of its stakeholders including employees, customers or clients, owners, and the wider public, especially the ones who can influence profits of a company. In the case of Nigeria's Rivers State oil and gas industry, stakeholders include not only shareholders but also employees, local communities, suppliers, consumers, environmental activists, government institutions, and non-governmental organizations (NGOs). According to the theory, taking care of needs of these stakeholders can help firms improve their long-term sustainability. Stakeholder theory implies that business organizations should not concentrate on generating profit but also should think about interests and welfare of all stakeholders.

According to stakeholder theory, the long-term success of companies requires a balance between the interests of stakeholders. In other words, this theory contradicts traditional views according to which businesses are supposed to take into account needs and interests of the stockholders only. Mwarabu and Onsiro (2024) emphasize that stakeholders are interdependent meaning that an action or interest of one group of stakeholders affects others. For example, decisions about waste management practices and environmental protection regulations made by oil and gas companies have an impact on lives of local communities and environment, which in their turn influence reputation and market position of these companies.

Empirical Review

For instance, Onyenoho and Inyiama (2023) investigated the relationship between environmental cost disclosures and productivity among Nigerian oil and gas organizations. The authors employed ex post facto research methodology analyzing secondary data from the financial reports of 12 listed Nigerian oil and gas companies. Using purposive sampling technique, they selected 7 firms. Environmental prevention costs, community development costs, and environmental remediation costs comprised the list of independent variables whereas revenue growth was considered a dependent variable. As a result of data analyses, they discovered a significant positive effect of those three environmental cost disclosers on revenue growth. Thus, environmental cost disclosure significantly impacts productivity within Nigeria's oil and gas industry.

Similarly, Akinyele and Eze (2024) evaluated the association between regulatory pollution costs and profitability among Nigerian oil and gas firms. Ex post facto, longitudinal research methodology was chosen to examine the effect of regulatory pollution costs on return on assets (RoA), which includes such measures as net income, capital structure, and other metrics. As shown, while initial cost outflows increase, there are potential financial gains in the long-run. Businesses' compliance with environmental regulations helps build their reputation and develop customer loyalty, hence improved profitability. Thus, although pollution regulations incur some costs, they are associated with financial gains related to reputation and productivity. It is recommended that organizations

adopt proactive measures and investigate sustainable oil and gas technologies to cut expenses. This research makes a contribution to institutional theory by identifying the effect of environmental policy on return on assets.

Alpheus and Nwankwo (2024) assessed the influence of environmental cost disclosures on earnings per share (EPS) among listed Nigerian manufacturing firms. Ex post facto research design was applied. Secondary data from annual reports published by Nigerian Exchange Group before December 31, 2022, were analyzed. As a result, it was revealed that pollution control costs (PCC), waste management costs (WMC), and employee health and safety costs (EHSC) have a significant positive effect on EPS. Therefore, the influence of environmental cost disclosures on financial performance should be considered significant, and investment in environmental training, charitable initiatives, waste management, and CSR activities was recommended to ensure smoother business operations in host communities.

Bamishe and Adegbie (2024) explored the effect of environmental conservation costs on financial sustainability among Nigerian oil and gas organizations. An ex post facto research methodology was applied with the help of secondary data collected from annual reports published by Nigerian publicly listed corporations. Inferential statistics methods were used, with external auditors ensuring the validity of the data. As a result of analysis, the authors identified that environmental preservation costs positively and significantly affect long-run financial sustainability (for example, working capital turnover ratio), yet negatively and insignificantly impact the bottom line. Therefore, increased spending on environmental preservation is beneficial for the financial health of stakeholders in the long run.

Arumona et al. (2024) examined the relationship between environmental information disclosure and financial performance among listed Nigerian construction firms. A longitudinal panel design with the use of secondary data from annual reports of seven listed construction companies between 2012 and 2021 was applied. As a result of analysis, it was found that waste management costs positively and significantly affect return on assets while employee health and safety costs negatively and insignificantly influenced RoA. Thus, the authors concluded that waste management costs are significant and suggested a proactive strategy to disclose information related to social and environmental waste management.

Gap in Literature

In the existing literature base, there is a lack of research addressing pollution control cost disclosures and return on assets. To be more precise, there is a lack of research establishing the link between legal regulations, community development costs, and waste management costs with return on assets metrics (average total assets, etc.). Though pollution control costs are included into sustainability disclosures, very few scholars have studied how these costs related to legal regulations, community development, and waste management impact return on assets of businesses in Nigeria's manufacturing industry.

Methodology

Research Design

The ex-post facto design is chosen for this research, as this research method entails analyzing past events in order to predict future outcomes.

Population of the Study

The population comprises five oil and gas companies in Rivers State, Nigeria that trade in the Nigerian Exchange Group from January 1, 2013 to December 31, 2025:

1. Aradel Holding plc
2. Seplat Energy Plc

3. Oando plc
4. Conoil plc
5. Eterna plc

Sample Size and Technique
Five oil and gas companies in Rivers State, Nigeria in 2013-2025 comprise the sample size, leading to the observation of sixty-five cases in thirteen years. Census sampling technique was employed because of the availability and reliability of data.

Sources and Method of Data Collection
Secondary data will be utilized to learn about the subject matter and overcome the difficulties. Cross-sectional data will be gathered by collecting audited annual financial statements of the five companies in the Nigerian Exchange Group site. These include the Corporate Information, Income Statement, Balance Sheet, and notes to accounts. Data will be obtained concerning costs of legal compliance, community development investment, waste management costs, and average total assets.

Measurement of Variables
In this paper, an attempt will be made to analyze the impact of pollution control cost disclosure on ROA of the quoted oil and gas companies in Rivers State, Nigeria. Pollutions control costs and its dimensions of Legal Compliance Cost, Community Development Investment, and Waste Management Costs will be the variables. The variable of Return on Assets (ROA) will be estimated based on average total assets.

Method of Data Analysis
Descriptive statistics, unit root tests, Hausman test, fixed and random effects regressions will be carried out.

Model Specification
Econometric Model Specification. as represented below:
Model 1: Average total assets (ATA) Model
ATA= f (LCC, CDI, WME) 1
This can be written in panel least square (PLS) form as:
$ATSt = a_o + a1LCC_{it} + a_2\ CDI_{it} + a3\ WME_{it} + U_{it}$.....2

Where:
LCC = Legal compliance costs as proxy for pollution control costs
CDI = Community Development investment as proxy for pollution control costs
WNE = Waste management expenditure as proxy for pollution control costs
ATA = Average total assets as proxy the return on assets
f = Function
t = Time period under study
a_o = Constant
a_1 -a_3 = Parameter or coefficient of the explanatory variable
u = Error term

DATA PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS.

Data Analysis

Descriptive Analysis

Presented in Table 1 below is the result of the descriptive statistics of the data as generated and computed for each of the variables to ascertain their behavioural pattern in this study.

Table 4.1: Descriptive Statistics of the Variables

Category	WME	CDI	LCC	ATA
Mean	4.630598	4.608141	7.143284	7.765545
Median	4.518817	4.823663	7.062466	8.081386
Maximum	8.493155	6.998727	8.854121	8.920546
Minimum	1.079181	1.079181	5.565556	5.9733
Std. Dev.	1.458624	1.184423	0.848468	0.738469
Skewness	0.634808	-0.282757	0.057526	-0.621463
Kurtosis	3.651650	3.077386	2.037847	2.320174
Jarque-Bera	5.515723	0.882360	2.543057	5.435700
Probability	0.063427	0.643277	0.280403	0.066017
Sum	300.9889	299.5291	464.3135	504.7604
Sum Sq. Dev.	136.1655	89.78284	46.07345	34.90151
Observations	**65**	65	65	65

Source: E- View Output, Version 10

The descriptive analysis is shown in Table 4.1 which gives an opportunity to observe visually how cross-section data behave. To check whether the study variables have normal distribution, the Jarque-Bera test was employed.

Unit Root Test

Below is shown the result of conducting unit root tests which form part of inferential analysis of the study. The process of testing for unit root is aimed at finding out the stationarity of variables before running regression analysis on them so that spurious regression can be avoided. The unit root of panel data for each variable was done using Fisher-ADF approach.

Table 4.2: Unit Root Test Results

VARIABLE	Fisher-ADF Test	Probability **	Order of Integration	REMARK
WME	-3.74299	0.0001	1(0)	Stationary
CDI	-2.71274	0.0033	1(0)	Stationary
LCC	-2.22840	0.0129	1(0)	Stationary
ATA	-3.98183	0.0000	1(0)	Stationary

Source: E-View Output, Version 10

Based on the outcomes of the Fisher-ADF unit root test, shown in Table 4.2, all variables under investigation—WME, CDI, LCC, and ATA—are either stationary in level or are integrated to order zero, considering that the p-values of these variables are below the 5% level of significance. Therefore, the null hypothesis of a panel unit root is rejected at a 95% level of confidence. This implies that the unit-root nonstationarity problem in the panel data for WME, CDI, LCC, and ATA has been solved..

TABLE 4.3: HAUSMAN TEST RESULTS ON MODEL1

Table 4.3: Hausman Test Results on Model I

Correlated Random Effects – Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f	Prob.
Period random	7.540156	4	0.1100

Period random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
WME	0.029745	0.010444	0.000157	0.1233
CDI	0.033963	0.030377	0.000032	0.5258
LCC	0.270563	0.244343	0.000191	0.0577

Source: E-View Output, Version 10

Chi-square = 7.540156 and p-value = 0.1100 for Table 4.3, a result that is greater than the 5% level of significance. Based on these results, the researcher adopts the random effects model as opposed to the fixed effects model. Therefore, the random effects model is better placed and reliable enough for the regression analysis in Model 1.

Table 4.4: Regression Estimation for Model I

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.025419	0.530829	-0.047885	0.9620
WME	0.010444	0.047638	0.219235	0.8273
CDI	0.030377	0.013853	2.192752	0.0325
LCC	0.244343	0.061729	3.958347	0.0002

	Effects Specification	
	S.D	Rho
Cross-section fixed (dummy variables)		
Period random	0.000000	0.0000
Idiosyncratic random	0.227047	1.0000

Weighted Statistics			
R-squared	0.915663	Mean dependent var	7.765545
Adjusted R-squared	0.903615	S.D. dependent var	0.738469
S.E. of regression	0.229265	Sum squared resid	2.943494
F-statistic	76.00020	Durbin-Watson stat	1.490657
Prob (F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.915663	Mean dependent var	7.765545
Sum squared resid	2.943494	Durbin-Watson stat	1.490657

Source: E-View Output, Version 10

The regression results are provided in Table 4.4 below: R2 = 0.915663, Adjusted R2 = 0.903615, F = 76.00020, DW = 1.490657. Thus, this regression model evaluates the impact of waste management expenditure (WME), Community Development investment (CDI), and Legal

compliance cost (LCC) on the dependent variable, Average total assets (ATA). Since the adjusted R2 is 0.903615, it means that this model can explain about 90.36% of the variation in ATA, whereas the remaining 9.64% is determined by other factors, not included in the research model. As for the Durbin-Watson statistic (1.490657), it is located in the range between 1–3, which means that there is no autocorrelation in the model. It also should be noted that there is a significant overall model since the probability value of the model is 0.000000, i.e., much lower than 5%, and F(76.00020) proves that this model is statistically significant for the selected sample of oil and gas companies in Rivers State, Nigeria.

Discussion of Findings

Legal Compliance Cost and Total Average Assets

According to Table 4.4, the t-statistic (3.958347) and p-value (0.0002) of legal compliance cost are lower than 5%, and therefore, the null hypothesis should be rejected and the alternative accepted. Consequently, this variable positively and statistically significantly impacts total average assets of listed oil and gas companies in Rivers State, Nigeria, during the period from 2011 to 2023. The research results correspond with those by Onyenoho and Inyiama (2023), Olowokere et al. (2021), Olumide and Olatunji (2023), Olusola (2021), Oraka (2021), Pamungkas et al. (2024), Raymond et al. (2023). However, Solomon (2020); Steve (2020); Tianiyu et al. (2021); Trevifio et al. (2024); Ulupui et al. (2020); Wozuru and Muah (2018); Yaakoo et al. (2021); Yiheng et al. (2024) obtained an opposite result.

Community Development Investment and Average Total Assets

Similarly, Table 4.4 demonstrates the positive and statistically significant effect of community development investment on average total assets, since the t-statistic and p-value are lower than 5% ($t = 2.192752$, $p = 0.0325$), and therefore, the null hypothesis is rejected and the alternative accepted. In turn, this finding corresponds with those by Appah (2026); Abiola and Alabi (2021); Adeyemi and Eze (2023); Ajibola and Ibe (2023); Akintoye and Hassan (2023); Akinyele and Eze (2024); Chukwu and Ogunleye (2022); Fatimah and Uzo (2023). However, Ibrahim and Ayinle (2024); Ibrahim and Bello (2023); Ibrahim and Suleiman (2024); Ige and Lawal (2021); Musa and Bello (2023); Musa and Bello (2024); Ojo and Adeyemi (2024); Olajide and Uche (2024) obtained a contradictory result.

Waste Management Expenditure and Average Total Assets

Also, Table 4.4 reflects the positive but not statistically significant impact of waste management expenditure on ATA because $t = 0.219235$, $p = 0.8273$, and both these values exceed 5%. In this case, the null hypothesis cannot be rejected and therefore, WME does not have a statistically significant effect on ATA. Nevertheless, this research finding corresponds with those by Bamishe and Adegbie (2024); Bukar (2022); Chikani et al. (2024); Damieihi (2023). Emmanuel (2024); Ezechukwu et al. (2024); Ezenwanfor and Chibuzor (2023); Fatimah and Uzo (2023) received opposite results.

Conclusions

From the findings above it is possible to make the following conclusions based on data analysis:

1. Legal compliance cost has a positive effect on average total assets among listed oil and gas companies in Rivers State, Nigeria, and this effect is statistically significant from 2013 to 2025;
2. Community development investment has a positive effect on average total assets among listed oil and gas companies in Rivers State, Nigeria, and this effect is statistically significant;
3. Waste management expenditure positively influences average total assets but does not have a statistically significant effect on ATA.

Recommendations

Based on the conclusions made above, the following recommendations can be formulated:

1. Oil and gas firms operating should strengthen adherence to regulatory and legal requirements, as compliance contributes significantly to organizational stability and the growth of average total assets.
2. Executives of listed oil and gas companies are encouraged to allocate resources to community development initiatives, since such investments can positively influence returns on assets and enhance the value of average total assets.
3. Oil and gas companies listed in Rivers State, Nigeria, should adopt more effective waste management practices to minimize operational expenses, improve environmental performance, and support increases in average total assets.

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